ABYSSIN
PHILOSO

42893/A

RAMAZZINI,
Bernardino

72845

THE
Abyſſinian Philoſophy
CONFUTED:
OR,
TELLURIS THEORIA
Neither Sacred, nor agreeable to Reaſon.

Being, for the moſt part, a Tranſlation
of *Petrus Ramazzini*, *Of the Wonderful Springs of* Modena.

Illuſtrated with many Curious Remarks
and Experiments by the Author and
Tranſlator.

To which is added,

A New Hypotheſis deduced from Scripture, an
the Obſervation of Nature. With an Addition of ſome Miſcellany Experiments.

By *ROBERT St. CLAIR*, M.D.

Non mihi, ſed rationi, aut quæ ratio eſſe videtur.
Milito ſecurus quid mordicus hic tenet, aut hic.
Scaliger.

LONDON,
Printed for the Author, and Sold by *W. Newton*,
over againſt St. *Bartholomew-Cloſe-Gate*, in
Little-Britain, 1697.

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Fig. 11

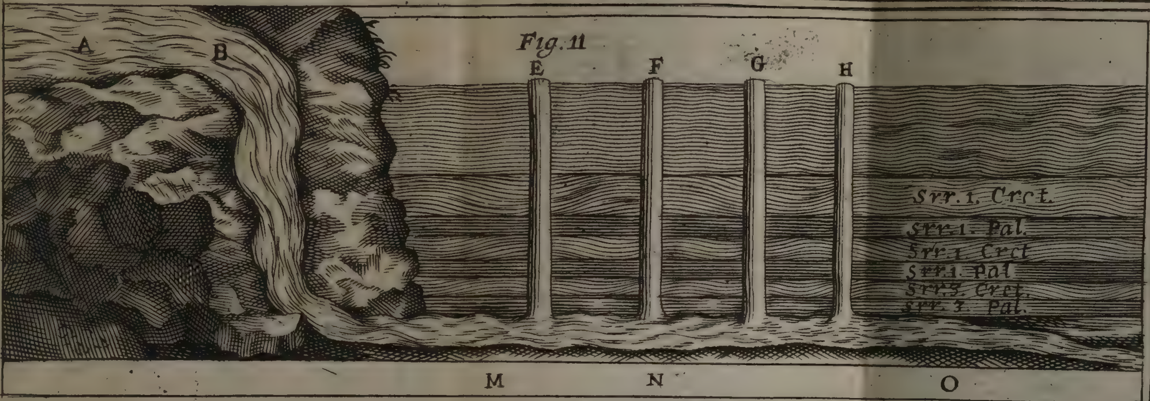


Fig. 1

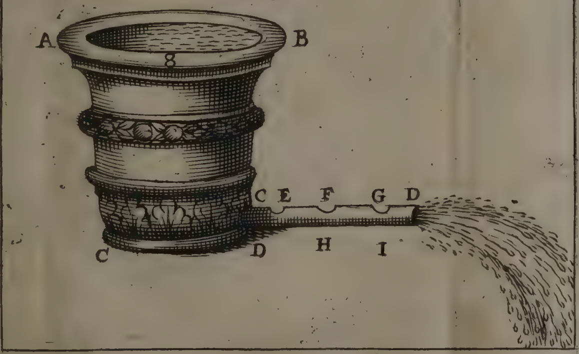


Fig. III

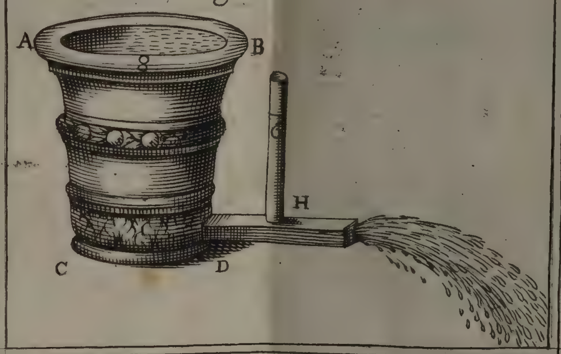


Fig. IV

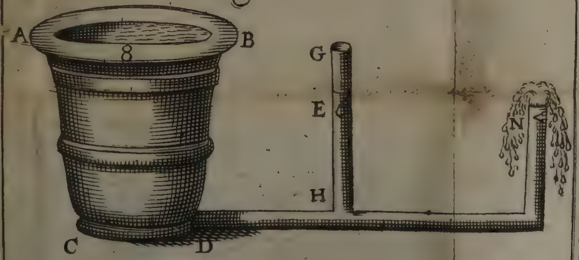


Fig. V

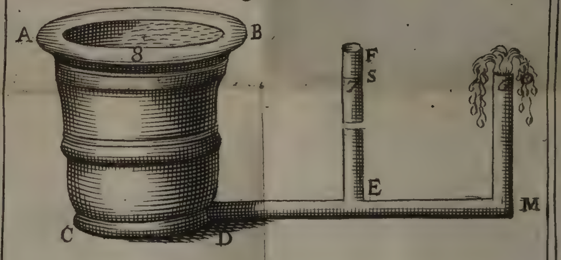


Fig. VI

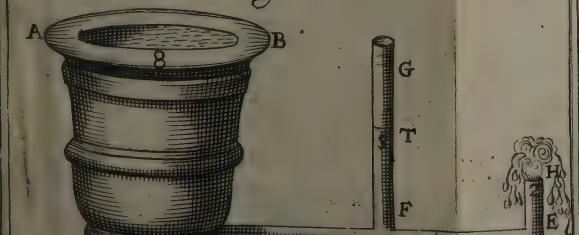
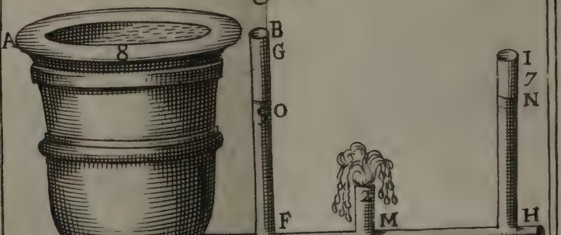


Fig. VII



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F. H. Van. Hove. sculp.

To the Truly

HONOURABLE

Sophronius Philalethes.

THIS Treatiſe of the Wonderful Springs of Modena, *publiſht in Latin by* Bernard Rammazzini *Phyſician of that Town, & Tranſlated by me, tho' it has upon view had the approbation of the moſt Knowing Mr.   beſide the moſt Eminent Phyſicians of the Colledge, and others, as the moſt admirable piece of Natural Hiſtory that hath yet ſeen Day in our* Engliſh *World; for therein are at once diſcovered the changes that Nature hath* not made but in ſome thouſand of years; yet I thought it not adviſeable for me to expoſe this ſtranger, how ingenious, ſoever to the publick view, and conſequently cenſure, without providing him a friend before-hand; eſpecially ſeeing he is to appear againſt an Author, whoſe Reputation for Learning, and this his Hypotheſis is ſo far eſtabliſht, that he has already brought it to many Impreſſions. Among all that I have the honour to be acquainted with, worthy Sir, I thought I could not addreſs my ſelf, to a fitter Patron than your ſelf. Whether the Dignity of the Subject, or the Modeſty and Ingenuity with which the Author ſets it out, be conſidered, this Treatiſe will merit your Approbation: Suffer therefore, worthy Sir, amidſt the Croud of your other more Important Affairs, this Curious Searcher of Nature, and Stranger, under your Patrociny, to do that ſervice to the Lovers of Knowledge, that Sir Matthew Hales makes the Clock-Maker to do to the Philoſophers; for he ſuppoſes that in a Country abounding with ſeveral Sects of Philoſophers, yet unacquainted *ed till then, with the noble Invention of Watches and Clocks, a curiouſly contriv'd Clock were expos'd to publick view, yet ſo that they ſhould have no acceſs to look into the inſide of it, The* Epicureans *would likely attribute it to the fortuitous concourſe of Atoms, the* Perpatetick *to the contemperation of the Four Elements, and the* Carteſian *to his three Principles, every one according to the Fancies he was prepoſſeſt with, but the Clock-Maker, whom he ſuppoſes behind the Curtain to hear all they ſay, ſteps out, and by opening the Clock, ſhews how wide they are all of the Truth, by letting them ſee the Spring, and the contrivance of the Wheels, on which the Motion of his Engine depends, and that it was he who made it. In the ſame Manner, Nature her ſelf, by the Pen of this Obſerving* Italian, *ſeems modeſtly to give a check to the preſumption of her pretended Interpreters, who will paſs a Judgment on her moſt hidden Works, where they never could pretend to make the leaſt obſervation, on which to found their Judgment. The reſpect the Author ſhews to Scripture Authority, is the rather remarkable in* *him, that he is a* Roman Catholick, *who by us are charged with the contrary Vice, which makes the fault of the Theoriſt, a profeſſed* Proteſtant, *more black, that is ſo bold in contradicting it, and making it ſpeak untruth to accommodate it ſelf to the capacity of the Vulgar, which tho' ſome Pious Divines have allowed in paſſages of Scripture, where the Phænomena of Nature are ſpoken of by the by, (which yet I prove to be a miſtake in the Confutation of the Theory) yet to make the whole firſt chapter of* Geneſis, *wherein the Spirit of God does* è compoſito, *give an account of the Creation falſe, is a piece of Preſumption few have been guilty of beſides our Theoriſt.*

As for the C*onfutation of the Theory, tho' the performance may be ſhort of what the Subject requir'd, yet I hope the deſign will pleaſe you, which is to vindicate the truth of the Scriptures, for which I know you have a great veneration, from the falſe gloſſes and perverſions of ſome that ſeem to have ſtudied Divinity, for nothing elſe but to ridicule it, which they do the more remarkably, that almoſt in the ſame breath they pretend a great reſpect* *to it, in which I endeavour to prove, that the paſſages the Theoriſt cavils at, are to be underſtood to ſpeak according to the Truth of the thing, and not according to the falſe Opinion of the Ignorant vulgar. If in this my ſmall endeavour, I may find your Patrociny, I ſhall not care for the diſpleaſure of theſe men of* Epheſus, *whoſe trade it is to make Shrines to this their* Diana *of Hypothetical Philoſophy, I mean who in their Cloſets make Syſtems of the World, preſcribe Laws to Nature, without ever conſulting her by Obſervation and Experience, who (to uſe the Noble Lord* Verulams *words) like the Spider, with great labour, ſpin a curious Cob-web out of their Brains, that is good for nothing but to be ſwept down, which tho' it has a great ſhew of reaſon, in effect, has no better right to that venerable Title, than the Fancies of thoſe who are ſaid to make Wind-mills in their Head. I have given the whole Book the Title of* The Abyſſinian Philoſophy confuted, *becauſe as the Preface is a confutation of the Theory, ſo if you read* Rammazzini *from* page 88, *at the end, to* page 102. *you will find that the Theory is much the* *ſame with the* Abyſſinian Philoſophy *if not taken from it, which being evident to be a mere fiction, is ground enough for the Title, and Confutation enough tho' I ſhould ſay no more. I ſhall not farther incroach upon your time, but here make an end, after I have ſubſcribed my ſelf,*

Worthy Sir,

Your moſt Affectionate,

and Devoted Servant.

Ro. St. Clair.

TO THE

READER.

WHen this Book came firſt to my hand, by the favour of a Friend, who about a year and a half a go, brought it from *Italy*, after once reading I was ſo taken with the principal matter of Fact therein contained, and the Ingenious things with which the Author Illuſtrates it, that I would not part with it till I could ſend it abroad in an *Engliſh* Dreſs, as being better than any other Argument, to ſhew the vanity of theſe Mens Labours, that would deſcribe to us a World of their own Fancying, inſtead of one of God's Making, who when they have ſet it out to the beſt advantage, can diſcover to us at the beſt, but a bare conjecture, which leaves the Mind uncertain, inſtead of ſatisfying it with ſolid Reaſon, and is unprofitable either as to Life or Religion; yet if that were the worſt of it, might be born with as other luxnuances of Humane Wit, that often ſpends it ſelf on ſuperfluities, when it is not ſufficient for things of real uſe.

Hoc habet ingenium humanum ut cum ad ſolida, Non ſufficit in ſuperracua ſe effundat. Verulum.

But when they come to overturn the Scripture, to eſtabliſh their own Prophane Fancies, as our Theoriſt has done, in favour of a Spurious Brat, of which he will needs be counted the Father; in this I think every one according to his ability ought to oppoſe it. Yet what ſatisfactory account can we expect from ſuch, of the Old World, and its great Change, ſo remote from us, that can give us ſo little account of the Preſent World, and the things in it, which yet would be by far more uſeful to us.

The Theoriſt has indeed ſet out this Fiction of his, with all the advantages of a ſmooth ſtile, which I believe hath procur'd it ſo good a reception with the generality, who are more taken with fine Words, than plain, tho' ſolid Reaſons; but if we may judge of the Buyers Inclination by the tendency of the Book, I am yet willing to have the Charity for the Theoriſt, that 'twas not the deſign of the Author; they are the ſame Perſons, who pretend they will not believe many things in Scripture, becauſe they cannot ſee a Reaſon for them, and yet they do greedily entertain this Theory, and the Fictions of *Des Cartes*, which differ little from the *Abyſſinian* Fiction or Hypotheſis, as will appear to any that compares both, with what is in this Book tranſlated from the *Italian*, only they have new vamp'd it, and ſet it out in another Dreſs to make it paſs for their own. But after I had taken a nearer view of the Author's Opinion, and what he advances in favour of it, I found it ſo full of contradictions to Scripture and Reaſon, yet join'd with a very high conceit of his own Fancies, (a fault I find very common among the *Abyſſinian* Philoſophers) that I had once thought of not meddling with it, as an endleſs labour, upon which account alſo, I have not meddled with a Book Printed at *Oxford*, *Anno*

De Antris Lethiferis, eſpecially ſeeing the Learned and Pious Mr. *Warren* has already done it ſo fully, that he has left little to be added to it; but conſidering that the bigneſs of his Book might obſtruct the attaining of the end for which he deſign'd it, *viz.* to undeceive the generality of Readers, who being the leaſt conſidering, perhaps have not allowed themſelves Time to read ſo large a Treatiſe, or at leaſt ſo attentively as it deſerves; upon this conſideration, (I ſay) I reſum'd my former thoughts, with deſign to be as brief as poſſible, yet without omitting any thing material in the Theory that deſerv'd an Anſwer. The Author begins *Tell. Theor. ch.* IV. *The Form of the Antediluvian Earth, was different from the preſent Form of it, which that he might not ſeem to dictate with an* αὐτὸς ἔφη *he promiſes to prove firſt from Scripture, ſecondly by Reaſons, both a* Priori & Poſteriori.

Now that we may ſee if the performance anſwer to ſo great undertakings, we ſhall firſt examine his main Arguments from Scripture, and eſpecially that of St. *Peter*, 2 1.ch. 3.5,6.ver. *For* *this they willingly are ignorant of, that by the Word of God the Heavens were of Old, and the Earth ſtanding out of the Water and in the Water.* v. 6. *Whereby the World that then was, being overflowed with Water, periſhed. Upon this Rock* (ſays the Theoriſt, prophanely alluding to our Saviours words to St. *Peter*) *do we chiefly build the Theory as to Scripture Authority; and we always thought this an unmoveable foundation,* Which yet we ſhall find upon a due ſearch, to be unſtable as Water, and therefore cannot hold.

The words of the Text the Theory explains thus, The Apoſtle manifeſtly diſtinguiſhes between the Old World and the New, and eſpecially becauſe of the different natural ſtates, or their different ſhapes and qualities of Matter. Secondly, He intimates that the form of the *Antediluvian* World was the cauſe of the Deluge. Thirdly, He ſays expreſly, the World periſht in the Deluge.

The Authour himſelf ſays, *That the Sacred Writers, when they treat of Natural things, do not* *Theor. l.* 1. p. 114.

thereby intend to inſtruct us in Natural Philoſophy, but to infuſe into our Minds Holy Affections, and a Veneration of the God of Iſrael, *whom they Preach.* May we not thence infer, that to have proſecuted this noble deſign, would have been fitter for a Divine, than thus to abuſe the Scriptures to another end, than that for which they were Written, when he founds a point of Philoſophy upon this Text; and farther, that ſeeing what he founds upon it, was contrary to the common opinion of the times that the Apoſtle wrote in, the Theoriſt has miſt the meaning of the Text. For whom among the Writers of the Apoſtles time, or before, can he produce that was of the opinion, that the *Earth did encompaſs the Waters, as an Egg-ſhell does the White and Yolk*; ſurely, ſeeing he ſeems ſo converſant in Antiquities, he might have thought it his intereſt to find at leaſt one paſſage among them, to favour this Paradox of this, that it might not be reproach'd with being the Opinion of one Dr. only.

And further we may infer, that as the Pen-Men of the Scripture, did not write to teach us Philoſophy, ſo neither does the Apoſtle here reprove Men for Ignorance in a point of Philophy, (eſpecially Abyſſinian) but for Atheiſtical Principles, as firſt in denying God's Providence, *v.* 3. *There ſhall come in the laſt day Scoffers, walking after their own luſts, and ſaying where is the promiſe of his coming, for ſince the Fathers fell aſleep, all things continue as they were from the beginning of the Creation.* Where the Apoſtle reproves Scoffers, who imagin'd that things went on by chance, and continued ſo in this firſt ſtate from the Creation, without God's Direction, which he carries yet higher, that they diſown the Power of God in the Creation, *For this they willingly are ignorant of, that by the Word of God*, &c. and as the charging of Men with wilful ignorance in a point of Philoſophy, that there was no poſſibility of knowing, before this new found Philoſophy, would have been very unjuſt, ſo it would have been a *Coque à laſne*, to have thus paſt from his ſubject and deſign of reproving Atheiſts, to reprove ignorance in a point of natural Philoſophy, and that without giving any notice of it before hand, and ſuch a reproof would have been no more ſuitable to the ſcope of the Apoſtle, than to have reproved them for ignorance of ſuch a place as *America*, which was diſcovered but of late.

But farther, this Text which the *Abyſſinian* makes his unmoveable foundation, if the ſcope be ſeriouſly conſidered, gives a ſtrong foundation of an Argument againſt him. The Apoſtle (as we have already proved) reproves thoſe who are willingly ignorant of the Power of God, and who either denied it altogether, as the *Epicureans* did, who were a famous Sect at that time, and who diſputed with St. *Paul* at *Athens*, Acts 17. 18. Or elſe ſuch as pretended to give an account of the firſt Formation of all things, without taking notice of the Power of God in it, which was ordinary among the Greek Philoſophers in thoſe times; now this is the fault the Theory is guilty of in the account of the Creation, all the Six days Works are in Scripture ſaid to be performed by the Word or Power of God, but in the Theory all is ſaid to be carried on by the Laws of Gravitation, without any mention made of the Power of God, which is the very thing that is here condemned by the Apoſtle, and therefore what the Theory thinks to make moſt for it, militates moſt againſt it. This Charge is juſtify'd from the Theories own words, *Tell. The*. ch. 6. *I have followed the moſt common Laws of Gravitation and Levity, and by their guidance alone, we have ſeen the Promogenial Maſs after one or two alterations, and an unconſtant ſhape, to have come into that ſtable form of the Earth built upon the Waters, that was to continue for ſome Ages*. Seeing therefore the Theoriſt has willingly left out any mention of the Power of God in his whole Theory, contrary to the Tenour of the Scriptures, which aſcribes all the Works both of Creation and Providence, to the Wiſdom and Power of God, he may be ſaid to be willingly ignorant of both, and to have written rather like a Diſciple of *Orpheus*, than a Diſciple of *Moſes*.

And yet his Laws of Gravitation, if rightly conſidered, will not anſwer the Phænomena of the Creation, for the World was then but a making, and might be then compar'd to the Materials of a Clock, before an Ingenious Artificer, which could never point out the Hours and Strike, imitate the motions of the Sun and Moon, as ſome are made to do, till the Artificer had firſt made the ſeveral Wheels, *&c.* in due proportion, and fitted them together, and laſt of all put a Spring or Motion to them, which I judge to have been compleated about that time, when he ſaid all was very good, which Motion has been continued ever ſince, except when he hath been pleaſed by his Finger, to put a ſtop to ſome of the Wheels, as he did when the Sun and Moon ſtood ſtill, or to make them run backward, as he did when the Shadow went back on the Dial of *Ahaz*, or to accelerate their Motions more than ordinary, among which may be reckon'd this of the Deluge, of which, and the Creation, 'tis as eaſie for the Theoriſt to give an account, as if he had been one God Almighty's Counſel at that time. One might think that the ſenſe of our natural blindneſs, even in things that moſt concern our ſelves, and that we have daily in our hands, might give a check to this preſumption, *but vain Man would be wiſe.*

Beſide this *Achillean* Argument and Foundation of the Theory, from which the Author hopes never to be beat, he has others, which at the firſt view, and as he is pleas'd to explain them, ſeem to favour his Cauſe very much, yet after examination, will be found to make no more for him than the former. One is taken from *Pſal.* 24. 2. *For he hath founded it upon the Sea, and eſtabliſht it upon the Floods*, or upon the Rivers. What could one think of, more favourable for the Theory than this? But if we compare this with other places of Scripture, it will not be found to make for his purpoſe; for example, *Pſal.* 2. ver. 3. *And he ſhall be like a Tree planted upon the Rivers*; no body I believe, will make a Philoſophical Argument of this, to prove that Trees in *David*'s time were planted upon the ſurface of Rivers, but contenting himſelf with the ſcope of the Pſalmiſt, which is to hold forth by this Simile, the flouriſhing condition of the Righteous, will never once call it in queſtion, if Trees did grow on the ſurface of Rivers, and take it for granted, that by *upon*, the Pſalmiſt meant upon the Banks of Rivers, in which ſenſe we ſay, Lands lye upon ſuch Seas as they are adjacent to, and Houſes or Cities, ſeated upon the Banks of Rivers, to ſtand upon the Rivers: For the word על in the original, imports this, and in this ſenſe may be explain'd, *Prov.* 6. 27. *When he ſet a compaſs upon the Face of the deep*, of which the Theoriſt ſays, *If I rightly underſtand the matter, this is the place of the Earth firmly encompaſſing the Abyſs, and what elſe can be underſtood by this Girth*, חוג *with which God is ſaid to have encompaſs'd the Abyſs, what is there in the preſent form of the Earth that can anſwer it, or to the Bounds or Globe which he hath put about the Sea.* Yes the Theoriſt might have found another meaning in, *Job* 38. *Who hath ſhut up the Sea with doors*, &c. ver. 11. *And ſet Bars and Doors, and ſaid, hitherto ſhalt thou come, and no farther, and here ſhall the pride of thy Waves be ſtay'd*; theſe Bars or Bounds are by all judged to be the Sea ſhore, by which God hath limited the Sea, that it ſhall no more return to overflow the Earth as it did before, as in *Pſal.* 104, 9. *Thou haſt ſet bounds that they paſs not over, that they turn not again to cover the Earth.* And in the common way of ſpeaking among our Hydrographers, this Bounds is called a Girth, ſo they call the Coaſt round about *England*, the Girth of *England*. Since the Theoriſt contrary to his own poſition, will adduce Scripture to prove his Philoſophical Paradoxes, by the ſame liberty we from *ver.* 5. of this Pſalm, *Who hath laid the Foundation of the Earth, that it ſhould not be removed for ever.* Infer that the Theoriſts Foundation is none of God's making, ſince it is ſuppos'd by him to have been removed, by falling under the Abyſs, whereas before it was above it. And may not we infer from God's challenge to *Job*, ch. 38. ver. 4. *Where waſt thou when I laid the Foundation of the Earth? Declare if thou haſt underſtanding*, v. 6. *Whereupon are the Foundations thereof faſtened?* (the very thing the Theoriſt pretends to tell) and to which *Job* (whom without diſparagement to the Theoriſt, we may imagine both a better Man and a Philoſopher than he) anſwers, *chap.* 42. *ver.* 3. *Therefore have I utter'd that I underſtood not, things too wonderful for me, which I knew not*; may not we (I ſay) infer, that the Theoriſt is very preſumptuous in thus taking up the Argument againſt God Almighty? And may not we without breach of reſpect ſay, *Theorice quid animum minorem æternis conſilijs Fatigas?*

This is the Philoſophy the Apoſtle *Paul* bids us beware of, *Col.* 2. 8. *Beware leſt any man ſpoil you through Philoſophy and vain deceits*, which will be very clear if we conſider, that the Hypothetical was at that time the Philoſophy in vogue among the Grecians, to whom being puft up with a conceit of their own Knowledge, the Goſpel appeared Fooliſhneſs, ſurely, the Apoſtle does not hereby condemn him that ſtudies to know the nature of things, with their cauſes, *&c.*

> *Ut varios uſus meditando extunderet artes.*

Which is Natural Philoſophy, for *Solomon*

lomon the wiſeſt of Kings, is in the Scripture commended for this, or him that ſtudies the nature of, and way to manage his own Spirit, and its Thoughts, *&c.* which is Metaphyſicks and Moral Philoſophy, both in their places very ſubſervient to Religion, but he condemns the Abyſſinian Philoſophy, or the impoſing of Poetical Fictions inſtead of ſolid Truth, on the underſtandings of People.

Now that we have view'd the Theoriſt's ſtrongeſt holds, and I hope beat him out of them, I think it will not be worth while to ſeek him out any where elſe, as to his pretences to Sacred Authority; we come next to view his Philoſophical holds, I hope though it be War time, we may view them without danger from Canons or Grenades, or at the worſt they will be but Paper ones, and will do no great hurt; and this comes in courſe, for after the Author has made the beſt he can of this place in St, *Peter* he diſtruſts the ſtrength of his own Argument, for in the beginning he confeſſes, that the meaning of theſe words ſeems not to be ſo ex-

Tell. Th. l. 1. c. 5.

preſs and open, that the form of the Antediluvian Earth may be thence concluded; & therefore he has recourſe to his Abyſſinian Philoſophy a very good ſecond, as we ſhall find: *Dignum patellâ operculum.*

Tell. Th. c. 5. p. 35, 36, 37. He ſuppoſes the Chaos to have been made up of Particles, different as to ſhape, bulk, weight, *&c.* and that the groſſeſt ſolid Particles by their weight falling downward, ſuddenly toward the Center, formed the Kernel of his Primogenial Earth, and that immediately there followed a new diviſion of the remaining part into two, and no more, *viz.* Fluid and Volatile, or Air and Water, of which the thinneſt and lighteſt part keeping uppermoſt, made the Air, and the groſſer the Water, out of which were ſeparated the Oily parts, which being lighter floated above it; and laſt of all he ſuppoſes another purgation of the Air, from its Earthy Particles, which falling upon the Oily Particles, were by their viſcidity entangled, and thus hindred from deſcending into the Abyſs, and theſe Earthy Particles he ſuppoſes by the heat of the Sun, to have been burnt into a hard cruſt, which made the Shell of the Primogenial Earth.

This is the ſubſtance of the Hypotheſis, from which as a Corollary, tho' not heeded by the Theoriſt, we may infer, a new ſett of Principles, *viz.* Oil and Earth, unknown to the Learned World before this Abyſſinian Philoſophy. Now may *Paracelſus* keep to himſelf his three Principles Salt, Sulphur and Mercury, *Ariſtotle* his four Elements, *Des Cartes* his three Principles of *Materia ſubtilis, globuli ſecundi elementi, & materia tertii elementi*, and the moſt experienc'd *Van Helmont*, his Axiom *Of Water and Seminal Principles all things are made*; tho' experience taught him, and others ſince him, that not only Oil, but alſo Salt, Earth, *&c.* are made of Water, which is known *à poſteriori*, or by the effect, or experiment (the Foundation of all the Knowledge we have of Nature.) But as for the Antediluvian World, ſince it doth not ſo much concern us now, I ſhall leave the conſideration of its Principles to the Abyſſinian Philoſophers, who demonſtrate all things *à priori.*

And yet in theſe ſeparations, the Theoriſt is not ſo Philoſophical as he pretends to be, for his diviſion of the Chaos, into Fluid and Volatile, Warer and Air, this is purely Abyſſinian or Fictitious, the Air being own'd by all Philoſophers Fluid as well as Water, nay rather more.

But the Fifth and Laſt Separation of the Earth from the Air, is contradictory to common ſenſe, as well as his own Laws of Gravitation; for how could it come to paſs that there remain'd ſo much Earth in the Air (which is 1000 times lighter than Water) after the four Separations mention'd, as to be ſufficient to make up the cruſt of the Antediluvian Earth? Why was it not carried down toward the Center, as faſt as the Water, or at leaſt the Oil? The ſimile of Snow and Hail falling down from the Air, will not anſwer the caſe in hand, for they riſe into the middle Region of the Air in form of a Vapour much rarify'd, by which rarefaction the Surface of every particle of Water, being made larger, the body becomes lighter than ſo much Air, and ſo aſcends till it come to the middle Region, where by its cold, 'tis condens'd, and ſo falls down in Rain, Hail or Snow, according to the different degrees of cold; that I may not ſeem to ſay this *gratis*, I ſhall illuſtrate it with an experiment, that will quadrate better with what I have ſaid, than the Theoriſt's Simile; let us ſuppoſe a ſmall Carps Bladder, with the Air ſqueezed out, and the Mouth cloſe tyed, to be thrown into a wide mouth'd Glaſs full of Water, it will ſink to the bottom, but if the Veſſel and all be put into the Pneumatick Engine or Air-Pump, and a Receiver fitted to it, upon exhauſting the Air from the Receiver, that little which remains incloſed in the Bladder, will expand it ſelf very much, and ſo both together will make an aggregate, lighter than Water, upon which it will riſe to the top, becauſe it has more Surface expos'd to its Preſſure, than it had before. Now if the Theoriſt can prove that his Earthy Particles were thus capable of expanſion and dilation, this Aſſertion of his, tho' but the Opinion of one Dr. ſhall have place among the probable ones, otherwiſe we will take it

for

for no other than Abyſſinian, or Fictitious. But ſuppoſe it to be true, we have no reaſon to think Fabulous or Strange *Pliny*'s and *Livy*'s Stories of Showers of Fleſh, Stones, *&c.* ſeeing the whole Earth, the Mother of All did thus Shower down out of the Air. And ſince our Author is Arbitrary in ſuppoſing, I think he might as well have ſuppos'd the Abyſs to have been ſhut up in a Bag of Raw Hides, which would have ſupported the Earth from falling into his Abyſs, till by being bak'd into a hard cruſt, it had been able to ſupport it ſelf; and this will better fit his Interpretation of *Pſ.* 33. 7. where the Sea is by him ſaid, to be gathered as in a Bag, for the hard cruſt of the Earth might be better compar'd to a Bottle than to a Bag. I would not have the Theoriſt think I put a jeſt upon him, in mentioning this of the Raw Hides, becauſe notable Feats, paſt belief, in the laying of Foundations have been perform'd by this means, a memorable inſtance of which is to be ſeen to this day in the Engliſh Church at *Utrecht*, where is a great Maſſy Pillar that was thus founded; the account I had of it when I was at *Utrecht* was this, when the Biſhop of *Utrecht* was building the Church, as they digg'd to lay the Foundation of this Pillar, they came to a Quick-Sand that ſwallowed up every thing that was put upon it, ſo that the raiſing of it was look'd upon as unpracticable, till the Biſhop propoſing a great reward to any that could bring the Foundation to bear, a *Friezlander* found out the way, and being overjoyed at the diſcovery, he told it to his Wife, which his Son hearing, told it to his Play-fellows in the Street, by this means it came to the Biſhop's Ears; ſo that when the Ingineer came to demand his Reward, he refus'd to pay him, ſaying, he knew it already, which ſo incens'd the cruel *Friezelander*, that he kill'd his Child and Wife for divulging his Secret, and the Biſhop for defrauding him of his Reward; in memory of this there is a Picture of an Ox upon the Pillar, with this Inſcription,

Accipe poſteritas quod per tua ſæculaa
nerres,
Taurinis cutibus fundo ſolidata columna
eſt.

Upon a Pillar at the end of the Church, are twenty or thirty Hexameter Verſes, giving an account of the whole Story. The Theoriſt needs not object, that the heat of the Sun, which is ſuppos'd to bake the Earth into a hard cruſt, might burn the Hides, for the Water in the Abyſs will ſecure him from this fear, a confirmation of which may be ſeen in *Buchanan*'s Hiſtory, where he gives an account of a way practis'd in theſe times for boiling of Meat in raw Hides, by which they became hard like Iron, and were not burnt. But if we admit that the afterbirth of the Earthy Particles, did (in the order ſuppos'd by the Theoriſt) fall upon the Oil, and there were by the heat of the Sun, bak'd into a hard cruſt, how will this agree with the Scripture? Gen. 1. 9. *Let the Dry Land appear, and it was ſo*; ver. 10. *And God ~~called the~~ Dry Land Earth*, &c. How was the Earth hardened by the heat of the Sun that was not yet made? For the Earth was made on the third, and the Sun on the fourth, ver. 16. *God made two great Lights, the greater to Rule the Day, and the leſſer to Rule* *the Night.* But ſuppoſe the Sun could do this under the Line, how came it to be ſo ſoon bak'd under the Poles, (where according to the Theory's ſuppoſition of the Poles, of the Eclip-tick and Æquator coinciding) the Sun could never riſe above the Horizon? Seeing now tho' the Sun ſhines half a year to theſe places, the Air is always very cold, and the Earth covered with Snow.

But let us ſuppoſe the Earth to have been thus hardened by the heat of the Sun and Winds, then it muſt be granted, that it hardened ſooner under the Line, than towards the Poles, and that before the cruſt was hard enough to ſupport it ſelf from falling into the Abyſs, it had acquired ſome conſiderable weight, by reaſon of which preſſing on the Surface of the Abyſs, it would, according to the nature of all Fluids, give way, and riſe towards the Poles; where by reaſon of the greater rawneſs of the Cruſt, the Water would meet with leſs reſiſtance, and ſo break the continuity of the Egg-ſhell; for I do not ſee by any thing the Theoriſt advances, how the Water which in the

natural

natural Ballance alters its place with the $\frac{1}{200000}$ of its weight, more on one ſide than on another, ſhould in this caſe hold firm, except by the above mentioned ſuppoſition of the raw Hides. Methinks I ſee the Oil'd Cake or Cruſt, thus falling in at the ſides, and riſing towards the Poles, and ſo the whole Fabrick of the Egg-ſhell ſpoil'd: and therefore Gentlemen I will by your leave take the liberty to entertain you with another Hypotheſis, while the Theoriſt is making a ſurer and better foundation than Water for his Primogenial Earth, or Egg-ſhell, but firſt crave leave to make an end of this ſearch. The Theoriſt does not tell in what proportion the Earth was mixt with the Oil, for Nature does all her Work in proportion; this the Apothecaries know in making their Plaiſters, where according to the Rule of Art, there is of Oil and Wax each an ounce, and of Powders half an ounce, for a ſoft Plaiſter; and for the hardeſt Plaiſter there is one ounce of Oil, two ounces of Wax, and Powders ſix drachms, which being cold makes a Maſs hard, almoſt like a Stone, but this, ſeeing it melts again with the heat, will not anſwer the end; the good Women know a certain proportion of Butter and Flower, which, tho' I am ignorant of, yet ſeeing it bakes into a very hard ſubſtance, might do here, were it not very brittle. The Theoriſt may think this a ridiculous compariſon, yet this I may be bold to ſay, and can make out if needful, that a good Woman that makes Butter'd Cakes to ſell them again, does more ſervice to the Publick, than the Doctor has done by his Theory. But he does very well to decline this, as being a thing impracticable, except he had been then on God Almighty's Council, or diſpens'd out the Ingredients; for if he had been then preſent, and but a bare Spectator, he could have done no more than now, *i. e.* to make a Conjecture good for nothing.

But farther, the Oil muſt have been of ſome depth, to incorporate ſo great a quantity of Earth; now the Theory does not tell where ſo great a quantity of Earth did ſtop in the Oil, whether near the ſurface, in the middle, or near the bottom, if they ſettled to the confines of the Oil and Water, the heat of the Sun, even under the *Torrid Zone* could not reach ſo far as to bake it into a hard Cruſt, except he be ſuppos'd to have been far more vigorous in his Actions, in his own, and the World's Infancy, than he is now in his old declining Age; for at Sea, within the *Tropicks*, we do not find now, that the Sun-beams penetrate much below the ſurface of the Water, this is known by the experience of the Seamen, when (under the Line) they let down their Plumets; for after they have been ſome time under Water 200 fathom deep, they bring them up ſo cold, that one cannot long hold his hand upon them, which obſervation the Mariners have improved to the cooling of their Liquors, better than we do here with Ice and Snow. It will be moſt convenient therefore, in my judgment, to ſuppoſe this forming of the Cruſt, on or near the ſurface of the Oil; but by this means 'tis very likely there would be a great quantity of Oil under that never incorporated with the Earth, or was never bak'd, ſo that when the Egg-ſhell broke, the Sea would be covered with it, like ſo much fat Broth, which, there being no more Earth to Rain out of the Air to incorporate with it, muſt have continued ſo to this day, except conſum'd with the ſuperfluous Waters after the Deluge. Yet further the Egg-ſhell or Cruſt was made before the Fiſhes and Fowls were produc'd out of the Water, which was on the fifth day, *Gen.* 1. 20. *And God ſaid, let the Waters bring forth abundantly; the living Creature that hath life, and the Fowls*, &c. ver. 23. *And the Evening and the Morning were the Fifth Day.* Now how can this be conſiſtent with a Cruſt of the Earth encompaſſing the Abyſs, in which there muſt be no opening or *hiatus*? Or elſe how could the Cruſt when it was firſt forming, be kept from falling in? In which caſe this Abyſs muſt be a very improper place for Fiſhes to live in, far more for their encreaſing and multiplying; for 'tis obſerv'd now in Fiſh-Ponds, if the Water be quite Frozen, that the Fiſh dye for want of Air, and therefore in *Holland* where they have a great many Fiſh Ponds about their Houſes, and great Froſts, they break the Ice from time to time, leſt their Fiſh ſhould dye for want of Air.

'Tis remarkable that the Plants were produc'd the ſame day with the Earth, before the Sun and Moon, but the living Creatures, *viz.* the Fiſhes and Fowls were not made till after the fourth day, in which the Luminaries were made, that they might have the benefit of the Sun and Moon to direct them by their Light, in their removing to and fro to ſeek their Food; but the Plants which receive their Nouriſhment ſtanding ſtill in the Ground, had not ſo great need of that Light, and therefore were made before.

From this we may infer, that the order kept in this ſhort Hiſtory, is not only to comply with the weak capacities of the Ignorant People, but to tell the Matter of Fact, and that there is no leſs reaſon for the Order of all the other parts of the Hiſtory, tho' the Theoriſt has the confidence to ridicule it, as being fitted only to the capacities of Ignorant Slaves, newly come out of *Ægypt*.

But ſuppoſing Fiſhes might live there for 1600 years as the *Fœtus* does in the

Mothers Womb, ſhut up in darkneſs, from the Air, and the Prolifick heat of the Sun; how can our Theoriſt give an account of the production of Fowls out of the Water, that is conſiſtent with the Scripture, for the Earth was made the third day, and firm enough to produce Plants, how, or at what vent got the Fowls out into the open Air? Suppoſe they could make their way through the Egg-ſhell, in places nearer the Poles, where 'twas ſtill but like Mudd; or was our Oil'd Cake not ſtrong enough by this time to keep the Birds from flying out? if not, ſurely they would be ſo daub'd with Oil or Earth, that they would never be able to raiſe themſelves out of the Mudd, or when raiſed, to fly.

But again, if the Fiſhes were thus inclos'd within the Cruſt, how could the Bleſſing of God upon Man take place? *ver.* 28. viz. *That he ſhould have Dominion over the Fiſhes of the Sea*, ſeeing for 16 hundred years they were ſo far remov'd from his Habitation, likely ſome hundreds of miles, the whole Cruſt of the Earth being interpos'd between him and them.

This fancy of the Worlds being like an Egg-ſhell, the Theoriſt owns he had from *Orpheus*, the firſt propagator of this *Hypotheſimania*, that prevails to this day, from whoſe time we may date the ruine of ſound Philoſophy, as the Lord *Verulam* ſays, *Bene fuit Philoſophiæ, priuſquam in tubas & fiſtulas Græcorum inciderit*: for this *Orpheus* was a Fidler or Pyper (if we judge of him by the times he liv'd in, which were very rude) no better than our three-penny Fidlers, that go about the Countrey to divert the Countrey Swains, made famous to us rather by the ignorance of the times he liv'd in, than his skill, according to the Proverb: In Blindland, he who hath but one Eye is a King; another thing has exalted his fame ſo much, the great diſtance of thoſe times from ours, and conſequently their obſcurity, by which it happen'd to him, as to deform'd Pictures, which at a diſtance ſhow very beautiful, but near hand, and in the light, appear what they are: and yet the Theoriſt compares this Man to *Moſes*, and the People of *Iſrael* he looks on as nothing but contemptible Slaves, tho' they had among them very knowing Men, as *Bezaleel* the Son of *Uri*, And *Aholiab* the Son of *Achiſaniah*, *whom God had filled with the Spirit of Wiſdom, in Underſtanding, and in Knowledge, and in all manner of Workmanſhip*; the Theoriſt, who likely is no great friend to Enthuſiaſme, will not own they had this infus'd into them, but it was acquir'd by frequent exerciſe, of which yet, God, from whom cometh down every good and perfect donation, *Jam.* 1. 17. in the Scripture-ſence, is the Author. They had among them alſo Apothecaries, for making their Perfumes.

For ought we can learn, this Man had no more ground for this, than our Theoriſt has now, that is, his own Fancy, and I judge to be no better grounded. What one broach'd of late that Water was made up of Oval Particles, or ſhap'd like an Egg, *Cartes* before him imagin'd Water to be made up of Particles like ſlippery Eells, if either of theſe Fancies could in the leaſt improve Water to a better uſe than hitherto known, they were not only to be born with, but to be entertain'd with thanks; but ſeeing 'tis quite otherwiſe, and this and all other Suppoſitions of this nature, have been in this point defective, they are good for nothing, but to amuſe, and to keep the Minds of Men that are naturally greedy of Knowledge, from farther ſearch after Knowledge. But while our *Savii* does thus follow and recommend to others their own Fancies (like Wildfire in the Night) without conſulting Obſervation and Experience, they have often verified the common reproach caſt on them, *That there is no Opinion ſo abſurd, which ſome Philoſopher or other has not maintain'd.*

As if the Author has ſhewn himſelf very regardleſs, how he has contradicted the firſt Chapter of *Geneſis*, ſo he ſhews himſelf regardleſs of contradicting likewiſe the ſecond, in which is given an account of Paradiſe and its Rivers, with their names, and alſo the Countreys through which they flow'd, with their names and qualities ſo particularly, that any in their right Wits, and that has any reſpect to the Scripture, will make no queſtion that this Countrey mark'd out to us, by the

Poſtidiluvians, *Cuſh* and *Havila* that Planted them, was the ſame with the Paradiſe in which God planted *Adam*, and that this is inconſiſtent with our Author's Suppoſition, of the Cruſt of the Earth falling into the Abyſs, in whoſe ruines would have been loſt all theſe marks, that in the Text are made common to Paradiſe, and the *Poſtidiluvian* Earth; the Theoriſt to evade the force of this Argument, embraces the fancy of thoſe who place *Cuſh* (that is encompaſſed with *Gihon*) in *Africa*, tho' from *Gen.* 11. 2. *And they journeyed from the Eaſt, and came into the Plain of* Shinar, *were they built* Babylon, and *chap.* 10. 8. *And* Cuſh *begat* Nimrod, and *ver.* 10. *And the beginning of his Kingdom was* Babel, *&c.* It might be inferr'd, that *Nimrod* gave the name of his Father *Cuſh*, to the Plantation at *Babylon*, ſeated upon *Euphrates*; and 'tis not improbable, that the *Aſhdim* or *Chaldees*, whoſe Capital City was *Babylon*, might have their Name thence by a change of the *U* into an *A*, common enough to other Nations, and an addition of the *D* at the end: this proof is ſo full, for the determining the place of *Cuſh* or *Æthiopia*, that it ſeems evident enough, that the Author of the Theory has never conſider'd it, otherwiſe he had not been ſo poſitive in denying a thing ſo eaſily deducible from Scripture. But I ſhall anſwer him farther in the words of Sir *Walter Rawleigh*, which, with the Map he gives of the Countrey, will determine the queſtion as much as can be expected, in a matter ſo remote from us.

Firſt he cites *Herodotus*, giving a Deſcription of the Iſle of *Eden*, that is but twelve miles from *Niniveh*, ſutable to none more than Paradiſe.

Cho. lib. 1. This Region of all we have ſeen is moſt excellent, it gives two-hundred-fold Increaſe, the leaves of Wheat and Barley are almoſt four Fingers broad; as for the Millet and Seſame, they almoſt as high as Trees; which tho' it ſeem incredible to thoſe that never were in the Countrey of *Babylon*, is yet moſt true. They have in all the Country Palm Trees growing of their own accord, the moſt of them bearing fruit, out of which they make both Meat and Drink, and Honey, ordering them as they do the Fig-Trees. But we paſs this, as not very material.

Then he ſays the word River is uſual for Rivers among the *Hebrews*, the Singular for the Plural, of which he gives Examples. *Let the Earth bring forth the Bud of the Herb, that Seedeth Seed, and the Fruit-tree*, &c. *Adam* hid himſelf in the midſt of the Trees, which in the *Hebrew* is העץ *Hagnets*, Tree.

Four Heads may be four Paſſages, or Branches, the firſt of which *Piſon*, runneth into *Tygris*, from whence is the name of *Paſytygris*, this leads to the Land of *Havilah*; the ſecond Branch is *Gihon*, this *Gihon* leadeth us to the firſt Seat of *Chus*; the third Branch may be *Hiddekel* properly ſo called, that is *Tygris*; the fourth is *Perath*. But be it a River or Rivers, that came out of *Eden*, ſeeing that *Tygris* and *Euphrates* are named in the Scriptures, there is no doubt but that Paradiſe was not far from theſe Rivers; for *Perath* is *Euphrates*, and *Hiddekel* is *Tygris* that goeth to the Eaſt of *Aſſyria*. He makes it evident, that *Cuſh* mention'd there, was not in *Africk*, but in *Aſia*; becauſe the *Æthiopians* mention'd in 2 *Chron.* 14. 9. could not go out againſt *Aſah* from *Africk*, with an Army of 1000000, ſeeing they had the potent King of *Ægypt* to ſtop them. A further proof of which he fetches from this, that the Cities which *Aſah* took from *Zeareth* their King, was in *Paleſtine*, viz. *Gerar* the Town that *Abraham* dwelt in, *Gen.* 20. 1. *And* Abraham *journeyed from thence toward the South Countrey, and dwelt between* Kadeſh *and* Shur, *and ſojourned in* Gerar. *Shur* was the firſt Ground that *Moſes* ſet foot on, when he came out of the *Red Sea*, Exod. 15. 22. He ſays further, That the *Amalekites*, the *Chuſites*, the *Iſhmaelites*, and the *Midianites*, in Scripture are taken promiſcuouſly for the Wife of *Moſes*, Daughter to the Prieſt of *Midian*, is called, *Numb.* 12. 1. a *Chuſite*, or *Æthiopian*, which is yet clearer from *Gen.* 37. 27. *Come let us ſell him unto the* Iſhmaelites, *v.* 28. *Then there paſſed by the* Midianites, *and they drew and lift* Joſeph *out of the Pit*, *and ſold* Joſeph *to the* Iſhmaelites; by all which it appears, beyond all diſpute, that the *Chuſites* mention'd 2 *Chron.* 14. 9. were on *Aſia*'s ſide of the *Red-Sea*, and not in *Africk*.

But let us ſuppoſe, That the Deluge happen'd, as the Theory ſaid, by the Egg-ſhell or Cruſt of the *Antediluvian* Earth falling into the Abyſs, what became of that part of the Earth on which the Ark ſtood? The Author of the Theory tells not whether it fell Horizontally, or inclining, as he ſuppoſes the other parts of the Earth did. If it fell inclining, then the Ark might have been in great hazard of over-ſetting, for ſurely it was far bigger than any of our Ships are at preſent (being as we may infer from its dimenſions, capable of 56857 Tuns of Water, and above, and ſo might have a Cargoe of 28428½ Tun) would not the Elephants, and other bulky Animals, by ſuch a diſorderly fall be in hazard of having their Brains daſh'd out, might not the joinings of the Ark have been thus parted; but the Theory paſſes by this in ſilence, and well he may, becauſe he was not there; if this be the reaſon of his ſilence, the ſame might have been a reaſon for his ſilence on the whole Subject, and to have attempted it, might have put him to the trouble of making a new Theory; the Deluge was a ſtupendious proof of God's Power, which we ought to ſit ſtill and admire. It is a Work he did but once, and has promis'd he will never do again, but moſt of his other Works he repeats over and over again, as if he did incite us hereby to examine them, that if in our firſt attempts we do not ſucceed, we may have occaſion to make new reflections, and have ſecond thoughts of them, that we may make ſome diſcovery uſeful to Mankind, but it ſeems this has never been the Theoriſt's Study. But for this Work he has done it but once, rather as a proof of his great Power, than to be pryed into. Why does not our Theoriſt likewiſe, give us a reaſon of the Sun and Moon's ſtanding ſtill in the days of *Joſhua*, and the Shadows going back on the Dial of *Ahaz* in the days of *Hezekiah*, there is no Theory of the Planets yet made, that will anſwer theſe Phænomena's; and ſince his Fancy is ſo fruitful of Hypotheſes, no doubt he will very much oblige the Curious of our Age, by ſaying ſomething to purpoſe on this Subject.

By all this it is evident, that the Theoriſt has had no regard, how he contradicted the Scriptures, and that to eſtabliſh his own Fancies as true, he ſticks not to make a Noſe of Wax of the firſt, ſecond, and ſeventh chapters of *Geneſis*, and *Moſes* to ſpeak only to vulgar capacities, while he himſelf ſpeaks to the Learned, (yet I do not ſee why if the Theory be the truth, *Moſes* who was Indited by the Spirit of God, could not have made it as plain as our Theoriſt) this is the rather remarkable in our Author, that he makes the Apoſtle St. *Peter* ſpeak a Philoſophical Paradox in favour of his Theory; if it be once granted, that the Scripture ſpeaks untruths, to favour the Opinion of the Vulgar, I leave it to the judgments of ſober and thinking Men, what may be the bad conſequences of it.

'Tis a matter of wonder to me, that he has the confidence to reject the firſt Chapter of *Geneſis*, as not true, but written to the capacity and humour of the Vulgar, a company of ignorant Slaves, newly come out of *Ægypt* (as he calls them,) and all this upon no better ground than common Opinions, for example, that the tasks of the days are very unequal, the Work of the firſt is done in an inſtant, and ſo the ſecond, but the Work of the third is very laborious; He would thus meaſure God Almighty's Power by his Weakneſs, there is nothing more or leſs difficult to him. The Theoriſt ſees this our Earth ſo ugly, with Barren Rocks, Mountains, and great Gulfs, (yet deſign'd for moſt noble uſes) that he cannot think it to have come thus out of the hands of the All-wiſe God, who ſhews ſuch skill in making the leaſt Fly; all which tho' admitted, will be but a ſorry Argument to prove that the *Antediluvian* Earth was of a different ſhape and make from the Earth we now live in: but he does not conſider, that Sin has brought in this univerſal change into the World, for this, not only the Earth, but the whole Creation groaneth, *Pſal.* 107. 36. He turneth

Arch. pag. 121, 122.

eth a fruitful field into barrenneſs, for the wickedneſs of them that dwell therein; which is viſible to this day in the Land of *Canaan*, that did formerly flow with Milk and Honey, which God himſelf did take care of, but now 'tis a moſt barren Countrey, in which yet there are ſpots of ground, that bear the marks of the antient fertility. But even admitting his way, of the Mountains being form'd, they muſt be allow'd by him to be of God's making, except he will openly declare for *Epicureiſm*; for all the confuſion that might happen on the breaking of his Egg-ſhell, not a crum of it could fall but by Divine Direction.

Other Arguments the Theoriſt has, to juſtifie his thus contradicting the Scripture, *viz. That 'tis evident from other places, that the Scripture ſpeaks not according to Phyſical Truth, but the Opinion of the Vulgar; for example, the Sun and Moon are called two great Luminaries, tho' Aſtronomy teacheth us, that the Moon is forty times leſs than the Earth, and by conſequence far leſs than the Stars.* But how is it made out, that by *greater* here, is meant greater in Bulk, and not rather in Light? (for the Scripture ſpeaks only of two greater Lights) and the Moon's light to us is the *greater*, not only in the opinion of the Vulgar, but even of the Theoriſt himſelf, at leaſt of as Wiſe Men, who find the Light of the Moon greater than the Light of the Stars; and therefore ſhe is ſaid to rule by Night, ſeeing at that time ſhe over-powers all other Lights.

Of no greater weight is that which is taken from *Joſh*. 10. 12. That the Sun and Moon are ſaid to ſtand ſtill, which is contrary to the Truth, ſays he, all being convinc'd now, that the Earth moves about the Sun, which granting to be true, we ſtill find the Argument not concluding, if we conſider that this is only a Hiſtory of the tranſaction of the day; *Joſhua*, when he ſaid ſtand ſtill thou Sun, thought that the Sun moved, and afterward as he thought, the Sun ſtood ſtill; but further one may ſay, they being *Carteſians* who preſs this Argument, that ſeeing according to their Maſters Hypotheſis, the Earth's motion depends on the motion of the Sun about his own Axis (which Courſe he finiſhes in 26 days) they ſtood both at once.

And yet after all our Theoriſt pretends a great reſpect to *Authoritas Sacra*, when he thinks it makes for his purpoſe, what is this but to treat the Scriptures, as the *Roman* Soldiers did our Saviour, they put a Crown of Thorns upon his Head, and ſaid, Hail King of the *Jews*? 'Tis not be queſtion'd but the Author had a view to get himſelf a Name by this his Theory, for *gloriam atque famam omnes ex æquo optant*, which ſought in a fair way is highly commendable; but our Theoriſt, who would get himſelf a Name by overturning the Authority of the Scriptures, is like to none more than *Eroſtratus*, who rather than fail of being known to after Ages, did burn the Temple of *Epheſus*. For of all that ever I have known to write of Philoſophy, the Author is the boldeſt in contradicting the Scripture.

——— ——— *Deus immortalis haberi*
Dum vult Empedocles, ardentem frigidus (*Ætnam*
Ignibus inſilunt. ——— ——— ——— ———

It were an endleſs labour to take notice of all his contradictions to Scripture, to Reaſon, and to his own deareſt Self, with which his Theory is deſervedly loaded; but we have already more than enough to juſtifie the Title *Tell. Theor. neither Sacred, nor agreeable to Reaſon*, and I think the Author has put an affront upon the underſtanding of his Readers, when he is ſo ſerious in making his Trifles paſs for Truths, and it ought to be no matter of wonder to him, if he meet with ſome ſuch cenſure in venting his Poetical Fictions, as the Traveller *Ulyſſes* (Poets and Travellers being reckon'd in the ſame rank as to point of Credit) is ſaid to have met with from the *Phaaces*.

——————— *Attonito cum*
Tale ſuper cœnam facinus narraret Ulyſſes,
Alcinoo bilem aut riſum fortaſſe quibuſdam
Moverat ut mendax Aretalogus in mare nemo

Hunc abicit ſæva dignum veraque Charybdi.
Fugentem Inmanes Læſtrigonas atque Cyclopás.

Nam citius Scyllam vel concurrentia ſaxa
Cyanes, plenos & tempeſtibus utres
Crediderim, aut tenui percuſſum verbere Circes,
Et cum remigibus grunniſſe Elpenora porcis,
Tam vacui capitis populum Phæaca putavit?

Of ſuch a practice when *Ulyſſes* told,
What think you could *Alcinous* Gueſts with-hold
From Scorn or Rage? Shall we, cries one, permit
This lewd Romancer, and his bant'ring Wit?

Of ſilly Dogs, and ſtranger flams than theſe,
Of Winds and Bags, for mirths ſake let him tell,
And of his Mates turn'd Swine by *Circes* Spell.

This Traveller takes us Iſlanders for Aſſes.

Thus the incredulous *Phæac* having yet
Drank but one round, reply'd, in ſober fit.

And therefore Gentlemen, I ſhall not any further trouble you with raking in this Dunghill; I proceed now to make out the reſt of my promiſe, and that is of an Hypotheſis more agreeable to Scripture and Obſervation, than that which we have been taking a view of. In which if I be miſtaken, I know 'tis *triſte humanitatis privilegium, poſſe errare*, which ſhall be all my defence. Yet in this ſurely it will have the precedency of the Theory, that in my way it can be repreſented to the Eye how the thing is poſſible, which I am ſure the Theoriſt cannot ſay of his.

I will not be ſo poſitive, as to ſay, this was the way and no other, for that were to ſay, That God could not make the World otherwiſe than we can imagine. For which I think the Theoriſt is to blame, as preſumptuous; for after he has given us ſeveral Pictures of his imaginary Changes of the Chaos, he ſits down and admires his own fancy in theſe words, *Tell. Theo.* p. 44. l. 1. *Truly being amazed with the greatneſs of the thing, I cannot forbear ſaying boldly, this is the* Theom Rabbah, *by*

Il ſe paſme.

by the breaking up of which the Deluge happen'd.

That which gave riſe to my conjecture, was an Experiment that I had occaſion to make, to ſatisfie ſome Gentlemen (who at that time did paſs a courſe of Chymiſtry, with me about the Cauſe of an Efferveſcence, between an Acid and Alcaly, which I hold to proceed from the ſudden excluſion of Air, out of the Pores of the Liquors, and the Salts by the two contraries uniting cloſely into one Body: in order to which, I made out that there was an Air in all Liquors, by the boiling of Spirit of Wine, *&c.* in the Air-Pump, when the Air is exhauſted: and this in oppoſition to Mr. *Lemery*, who only attributes it to a great commotion, and to *Des Cartes*, who attributes it to his Æther, of which Notion an Ingenious Gentleman, and very ſucceſsful in the practice of Phyſick, was ſo poſſeſs'd, that he thought there could not be a more proper ſolution of this Phænomenon; to which I anſwer'd, that it could not be from the Æther, ſeeing I had it Priſoner in a Glaſs, and found it to contract it ſelf with cold, and expand it ſelf with heat, which would be derogatory from the ſubtlety of the Carteſian Æther, upon which he and Seignor *Spoletti* the *Venetian* Ambaſſadour's Phyſician, were pleas'd to honour me with a viſit at my Chamber; the Experiment was this, I had a Glaſs Pipe, ſuch as they make the Baroſcopes of, blown into the ſhape of a round ball at the end, that was Hermetically ſeal'd and bended into a Syphon, whoſe legs were parallel; but diſtant from another three inches, ſo that the leg on which the Ball ſtood, was nine inches long, but the other two feet long; the ſhorter Leg, and the intermedial Pipe I fill'd quite with Water, to the lower end of the great Leg, ſo that there was no Air left in the ſpace, then I put into it ſome filings of Steel, about a drachm and an half, and after the filings were laid along in the intermedial Pipe, I put to it Oil of Vitriol 30 or 40 drops, which mixing with the Water (for otherwiſe ſtrong Oil of Vitriol does not work upon the filings) did immediately corrode the Iron, and ſent up to the Ball ſo great a quantity of this generated Air as to fill it, and half the ſhorter Leg in a very little ſpace, in which it was remarkable, that applying my warm hand to the Ball, it did expand it ſelf in an inſtant, ſo much as to drive out the Water at the longer Pipe, but on with-drawing my hand, it contracted it ſelf into half the Ball, where it has ſtood ever ſince *December* laſt year, now it's *November*; another thing very remarkable in this is, a conſiderable heat that is to be obſerv'd ever ſince, on the top of the Ball, ſuch as is obſerved in the great end of freſh Eggs, and this tho' the Water, the other half, be very cold, and at the ſame time ſome of the Vapours got out into the open Air. At the firſt it had a ſaltiſh taſte on the top of the Ball, which I could not obſerve in the Summer, but now in *November* I obſerve it very remarkable with the heat, and ſo it appeared to a young Gentleman that was with me at that time.

Before I come to apply this to the ſubject in hand, it will be neceſſary to remark from Scripture, *Gen.* 7. 11. that there were then and ſtill are, great Cavities in the Bowels of the Earth, full of Water, to which agree the Teſtimonies of the Authors mentioned in *Ramazzini*. Theſe Cavities, ſeeing the Scripture ſays nothing to the contrary, we may ſuppoſe to have been made from the beginning, not as Deformities, but for noble and excellenr uſes, and that by taking off the upper Cruſt from ſome parts of the Earth, and laying it on others, the everlaſting Mountains, and a Bed for the Ocean were fram'd at the ſame time, and thus a paſſage was open'd for the Waters, that before encompaſs'd the Earth, to run into theſe Cavities: 'tis not material for our purpoſe, whether this was all done in one day, as the Theory objects, or whether the Water could run ſo faſt away from the Inland places, as to leave them quite bare, it is enough, if in that day the dry land did appear, as doubtleſs a great part of it did. The Theoriſt thinks this a very laborious Work: as if it were a hard thing for the Author of Nature (who tells his Servants, that if they had Faith but as a grain of

Ram. p. 58, 76.

Muſtard-Seed, they might remove Mountains into the Sea) to remove the Mountains out of the Sea.

2. That this Abyſs did communicate with the Ocean, which is a conſequence of the firſt, and ſupported by the Teſtimonies of *Ram.* p. 125, 158.

3. That in theſe Cavities might be generated Minerals and Metals, *Ram. p.*32. and that by the colluctation of ſeveral contrary Salts in the Abyſs, might be generated an Air and ſometimes ſo ſuddenly as to make Exploſions; of which, and the firſt Suppoſition, Earthquakes, and the rocking of the Earth ſeem to be a pregnant inſtance, *Vid. Brit. Bac.* p. 73. Where 'tis related that the Earth roſe nine foot high, and was thrown ſome diſtance off, which ſure was from an Exhalation or Wind pented in, and ſuddenly expanded.

5. We may allow alſo that there were Mountains in the beginning, which ſeems to be plain by *Pſal.* 90. 2. in which the formation of the Earth, and the Mountains are mention'd as coæval, and therefore are called everlaſting Mountains, *Gen.* 49. 26. This

may be by good conſequence alſo inferr'd from the ſecond chapter of *Gen.* wherein 'tis ſaid, there were Rivers, one of which, *viz. Euphrates* is to this day known by the name that it had then: from whence we may ſafely conclude, that the ſame Rivers had the ſame Mountains, from which they deſcended, that they have now. Now if we ſuppoſe, that at the time of the Deluge there happen'd ſuch a conflict of contrary Salts, Acid and Alcali, as we have now mention'd in the Bowels of the Earth, there would be an Air generated, which in many places being penned up, might cauſe Earthquakes, and at the ſame time ſome of this Exhalation might eſcape into the open Air, from which might proceed the great Rains of forty days continuance, accompanied likely with great Thunder, Lightning, *&c.* to ſtrike the greater terror into the Wicked, that in their fright they might not find the way to the Ark they had formerly ſo much deſpis'd, and that if they had thought of ſuch things, they might be hindred by the great Rains; by the Air inclos'd in the Bowels of the Earth we may (as it happens in our Experiment) imagine, that the Water of the Abyſs was diſlodg'd, and ſo came out to overflow the Earth: (by which we may interpret the opening of the great depths) and this at the paſſages by which the Abyſs and Ocean did communicate, which ſo ſwell'd by degrees, till the top of the higheſt Mountains were covered; Further we may infer, that the Antediluvian Air being infected with the Mineral Seams, and in a great meaſure compos'd of them, might occaſion that ſhortning of Man's Life, which happen'd quickly after the Deluge; which tho' it did not ſo viſibly affect the ſtronger Conſtitutions of *Noah* and his Sons, might lay ſuch a foundation of infirmities in their Poſterity, as might in *Moſes* days ſhorten their Life to 70 or 80 years. We may ſuppoſe likewiſe that (as in our Experiment) when the heat of the Efferveſcence was over, the Water fell in the greater Pipe, and roſe in the ſhorter, ſo when this Ebullition was over in the Bowels of the Earth, the Waters returned by degrees into the Bowels of the Earth, and ſo the Ocean into the bounds ſet to it by God, as in *Pſal.* 104. 6. *Thou covereſt it with the deep as with a garment: The Waters ſtood above the Mountains.* ver. 7. *At thy rebuke they fled, at the voice of thy thunder they haſted away,* ver. 8. *They go up by the Mountains, they go down by the Valleys, unto the place which thou haſt founded for them,* ver. 9. *Thou haſt ſet a bound that they may not paſs over, that they turn not again to cover the Earth.*

One might repreſent the whole of this to the Eye thus, let there be a round Ball to repreſent the Earth,(with a hole at the end, ſtanding for the North Pole, at *a*, which *Kircher* ſuppoſes the Ocean to circulate thro' the Earth) of glaſs *f f f*, full of riſings to repreſent the Mountains *b b b*, let the Ball be fill'd with Water, and at the hole inſert a Pipe *g g g*, which cement to the Neck, throw in by this Pipe ſome filings of Steel, after which ſome Oil of Vitriol, and keep the Ball inclining, ſo that the ſteams ariſing may not get out at the hole, but being pented in may drive out the Water at the Pipe, which if the Ball were the Center of the Earth, would overflow all the ſurface of the Glaſs, and cover the Mountains of it, but this being wanted, we may imagine another glaſs *c c c* divided in two as you ſee, ſo that they may be cemented together when the other glaſs ball is inclos'd, all the Water that runs out at the mouth of *g g g*, will over-flow the Hills *bbb*, *&c.*

This is the ſubſtance of what I have to ſay of my Hypotheſis, which if furniſh'd with a good Library, with large Indexes, it were eaſie to make ſwell into a Volume big enough to deſerve the title of a Theory; among which I might perhaps find, even in the Relicts of the Fidler *Orpheus* himſelf, ſo much eſteemed by our Theoriſt, or at leaſt among the other *PLACITA PHILOSOPHORUM*, enough to favour it.

Sed non equidem hoc ſtudeo bullatis ut mihi (nugis
Pagina turgeſcat, dare pondus idonea (fumo.

And with this I leave the Theory at preſent, haſtning to make an end.

Of Perpetual Lamps.

THere has been much written of Perpetual Lamps, ſaid to be found in Burying places of the old *Romans*, which at firſt ſeems paſt all belief; for how can it be that a Lamp ſhould have fuel for ſome hundreds of years, to maintain it in life? And if it had fuel how could it in thoſe cloſe Vaults eſcape being ſuffocated in its own ſmoke? I believe that the appearing of ſome light by the Work-mens Tools, hitting againſt ſome hard Stone or Brick in the dark, and ſo ſtriking fire, might give riſe to the firſt report, which Fame, that never loſes by going, has increas'd almoſt to a Miracle. For they ſay of them, that upon the Air's coming to them, they, contrary to all other fires, do preſently die. Or they might have met with ſuch an Obſervation as a noble Lord told me he had communicated to him when at *Rome*, by a Gentleman of that place who made it; and it was this, that ſearching *Roma Subterranea* for Antiquities, he came to a Brick-wall, which ordering to be digg'd thro', he found to be the Wall of a Vault, or Burying-place, in which before the Light was brought in, he obſerv'd ſomething like a Candle burning, which he loſt ſight of as ſoon as the Candle was brought in; and therefore removing it again, and directing himſelf by his Hand kept between the Light and his Eye, he found it, and by the deſcription I had of it from that noble perſon, it was of the nature of Mr. *Boyl's Glacial Noctiluca*, for it was ſolid, and in a fortnights time did run *per deliquium*. But whatever be of truth in it, the Ingenious have made many Conjectures about the ſalving of this wonderful Phænomenon. *Des Cartes* has attempted it by applying his Principles to it, but ſeeing they are *Abyſſinian*, *i. e.* precarious, and the explication hardly intelligible, we paſs it in ſilence. *Athanaſius Kircher*, πολυμαθεϛατὶς has given us his conjecture, which ſeeing it depends upon a Mechanical Principle, is by far more intelligible than any we can expect out of the Mint of a mere *Abyſſinian*. He ſuppoſes that theſe Lamps are ſeated upon the opening of a Vein of *Petroleum*, running under ground, of which *Italy* and other hot Countries afford many, and the Wick to be made of Linum Asbeſton, which never waſtes in the fire; ſo that Nature conſtantly furniſhing freſh fuel, and the Wick never failing, the flame may continue forever. But how plauſible ſo ever this Conjecture be, it will be of ſmall uſe, becauſe it cannot be had every where. Therefore the Ingenious Dr. *Hooke* has contriv'd, and imparted to the World ſeveral pretty ways, which are found to anſwer very well; for by the poyſing of his Lamp, he orders it ſo, that the Oil may always be kept to the ſame height, upon the Wick, and conſequently the flame, and that therefore the Wyck can never waſte, becauſe always in the flame, for it waſtes not tho' in the midſt of the flame, till it be expos'd to the open Air; of which one may ſee more at large in his Treatiſe of Lamps: but with ſubmiſſion I am of opinion, that the weight of the Oil when the Lamp is full, will make the Lamp move heavily, and alſo make it wear out quickly. I have therefore a good while ago, thought theſe inconveniencies might be prevented by ſome Hydroſtatical contrivance, ſeeing the main thing ſought for here, is to keep the flame at the ſame height on the Wyck; my way is this, let a Veſſel *a a a*, be ſhap'd after the faſhion here mark'd, an inch or more deep, and as broad as you may think fitting for the quantity of Oil you are to burn, let alſo a Pipe *b b b*, coming from the bottom almoſt as high as the Ciſtern, be filled firſt with Water *c c c*, ſo high as to cover the hole of the Pipe at the bottom, that the Oil *d d d* poured in afterwards may not get out at the Pipe *b b b*, and ſo be loſt; let the Veſſel being almoſt brimful, have a cover'd pierc'd with as many holes as 'tis deſign'd to have Wycks, be fitted to the mouth of the Veſſel, when the Wycks are lighted, if Water falls in by drops at the Pipe, it will keep the Oil always to the ſame heighth, or very near (the weight of Water to that of Oil, being as $20\frac{8}{11}$ to 19) which in the depth of an inch or two, will make no great difference of height in the Oil, if the Water runs faſter than the Oil waſtes; it will only run over at the top of the Pipe, what does not run over coming under the Oil, will keep it to the ſame height, this it will do perpetually without any fear of rub or let, the cover will keep the Soot of the Lamp from falling into the Oil, and keep it from thickening with it, The main uſe of ſuch a contrivance is, where there is occaſion for long digeſtions with a gentle heat.

Some Thoughts about the way of making Oil of Sulphur Per Campanam.

Sulphur at all times has been counted a wonderful product of Nature, and therefore by the Greeks is called *τὸ θεῖον.* Several attempts have been hitherto made by Chymiſts to analyſe it, which they have hitherto done but in part (that I know of;) yet by this they have diſcovered it to be a Mineral Oil, coagulated by a mineral Acid, and alſo the ſame is made evident, by the compoſition of it; for if you mix Oil of Sulphur with Oil of Turpentine, they will coagulate into a gummy ſubſtance which being ſublim'd, give true Brimſtone. The main experiment inſiſted on is the making of Oil of Sulphur P. C. Only two or three ounces of Genuine Oil, can be had this way out of a pound, and all the reſt ſeems loſt, which I believe moſtly to proceed from a defect in the way of making it. It is about fifteen years ago ſince firſt reading *Lemery*'s Preparation of *Ol. Sulph. P. C.* I thought it might be improved to the catching of all, or moſt of that which flies away thus. Suppoſe a flat glaſs Cup, *b b b*, to have two or more Pipes coming in at the bottom, and riſing pretty high in the glaſs *a a a*, ſuppoſe likewiſe another ſhap'd like a Matraſs, fitted to the mouth of *b b b*, with a Ring at the bottom *c c c*, to keep it from falling into the Cup, and that the ſame Matraſs is wide enough at top to admit of a crooked Pipe *e e e*, to come into it, and to be luted to it, to which muſt be faſtened Adapters, with ſome Water in them, that the Acid Spirit paſſing, may find in the way wherewith to embody it ſelf: now if Brimſtone be put into a Cup, and ſo put into the Glaſs below, with the cautions uſual in that caſe, and ſo kindled, and the Matraſs fitted to it, the Air coming in by the Pipes will keep the flame in life, and carry up the lighter fumes by the neck, into the Adapters *f f f*, which with the Water may condenſe into an Acid Spirit. This Experiment might be varied, by inſerting the Neck into the Wall of a very large Room, made tight for the purpoſe, as they do for Flower of Brimſtone, to ſee what dry Flowers it gives, and of what nature they are.

Of

Of Phoſphorus.

I Have ſeen in the *Pariſian* Memoirs, lent me by the curious Dr. *Sloane*, an Experiment ſaid to be made by one Mr. *Homburg*, about producing *Phoſphorus* out of Quick-lime and Sal-Armoniack; 'tis that which I caſually lighted on, when living with the honourable and never to be forgotten Mr. *Boyle*; for after I had by the force of the fire melted theſe two together into an Opack Glaſs, and the pieces of it were ſtill hot in my hand (during which time they are very hard) I had the curioſity to ſee what the pieces which were very hot would do, if ſtruck againſt one another in the dark, and was ſurpriz'd to ſee it not only ſtrike fire, but alſo to retain a glimmering light in the places where the pieces hit one another, which I judge to proceed only from the Sea ſalt of the Sal-Armoniack remaining with the Quick-lime, put in a violent motion by the colliſion, and perhaps deſerves no more the name of a *Phoſphorus*, than the Sea Water that ſhines in the dark night, or refin'd Sugar, when 'tis ſcrap'd; a proof of which ſeems to be the dark ſpots that appear in the ſhining parts, which is in all probability from the greater quantity of the Quick-lime in the mixture, for of two ℔ there is but ℔ I. ℥ IV. of the Glaſs, ſo that only ℥ IV. of the Sal-Armoniack may be concluded to be there.

This when cold; runs *p. d.* which it continues for a long time; and when ſet to evaporate, does retain its fluidity while upon fire a long time, but when removed, in an inſtant it coagulates into a hard Maſs, which upon the leaſt heat melts again, and therefore by Mr. *Boyle* was called the fuſible Salt. I will not ſay that Mr. *Homburg* had that from Mr. *Boyle*, or any of his friends; for why might not he fall on it by chance, as well as we, tho' this account was Printed two years after the honourable Mr. *Boyle*'s death? But to paſs this, this Liquor is very remarkable for diſſolving ſublimate corroſive, in the cold of which it diſſolves its own weight. *Quercetan* makes a Spirit of this Solution thus, R. of this Liquor, *p.* 111. diſſolve in it *ſublim. corr.* p. 1. imbibe the Solution with brown Paper, and Deſtill, it comes over in form of a browniſh colour'd Spirit, ſmelling like Musk (ſays my Author) ſome of the Mercury is reviv'd in the Receiver: three drops of this Liquor taken in a convenient vehicle, do greatly purifie the Blood, as he ſays; as for the ſmell, 'tis ſo far from having the ſmell of Musk, that rather it ſtinks of an Empyreuma; and as for its uſe in Phyſick, 'tis ſo far from having the promis'd Effects, that I have known it given from three to ſixty drops, without any viſible effect, and alſo that a Woman, to whom an hundred drops were given in a Venerial Diſtemper, had ſuch pricking pains all over the body following, as could hardly be removed again: yet this, with all its Miſtakes, has a famous Plagiary in Town, copied out in a Book called the *Lond. Diſpenſ.* this man it ſeems has no regard to what he Writes, ſo he make a bulky Book, I could inſtance many caſes in which this Rhapſodiſt has thus without any judgment play'd the Plagiary, if time would permit; it were to be wiſhed that a ſevere Cenſure were put upon ſuch, who for a little Lucre; will thus ſet out a Wild-fire to lead People into dangerous Miſtakes, inſtead of ſetting up Beacons for them, by which they may be guided in ſo important a buſineſs as the practice of Phyſick, at leaſt an *Index Expurgatorus*, made by an impartial and judicious Pen, might remedy the ill Effects of ſuch Books, and prevent the multiplying of them for the time to come.

ERRATA.

PAGE 44. in the Margin, *Tab.* 11. *f.* p. 69. in the Margin, *Tab.* 11. *f.* 2. p. 70. l. 14. r. *The Water overflowing and falling. ibid.* l. 23. *or being*, r. *are.* p. 81. l. 18. *by hidden paſſages, and the Sand it ſelf.*

THE
Abyſſinian Philoſophy CONFUTED:
O R,
TELLURIS THEORIA
Neither Sacred, nor agreeable to Reaſon.

Being, for the moſt part, a Tranſlation of *Petrus Ramazzini, Of the Wonderful Springs of* Modena.

Illuſtrated with many Curious Remarks and Experiments by the Author and Tranſlator.

To which is added,

A New Hypotheſis deduced from Scripture, and the Obſervation of Nature. With an Addition of ſome Miſcellany Experiments.

By *ROBERT St. CLAIR*, M.D.

Non mihi, ſed rationi, aut quæ ratio eſſe videtur.
Milito ſecurus quid mordicus hic tenet, aut hic.
Scaliger.

LONDON,
Printed for the Author, and Sold by *W. Newton*,
over againſt St. *Bartholomew-Cloſe-Gate*, in
Little-Britain, 1697.

THE AUTHOR's PREFACE.

IF *the Searchers after Nature, of which this Age has not a few, whoſe Study is ſpent about things of greater Concern, and therefore are deſervedly admired; if, I ſay, theſe found it as eaſie to ſearch into the inner parts of the Earth, as 'tis to the Anatomiſts to take an exact View of the Bowels of a Man, and other Living Creatures, the one needed not envy the other; and we ſhould have as full a Knowledge of the Earth, as we have now of Living Animals, by the Induſtry of Anatomiſts. We know now, yea to our own no ſmall Satis-*

faction, with our Eyes we ſee, how the Blood circulates, what is the Motion of the Chyle, the Lympha, and other Fluids; ſo that now to uſe Hippocrates *his own Words, The Fountains of Humane Nature, and the Rivers with which the Body is watered, ſeem to be open'd. But as for the Earth, out of whoſe Treaſures we draw our Nouriſhment, we can obſerve nothing but its outward ſide, and therefore we are ignorant of the more beautiful things that are hid; and, which is to be grieved for, there is no way by which they may be known. For although the Miners have gone down into the Bowels of the Earth many Fathoms, yet they have never gone much deeper than half a Mile, which by* Agricola *is ſaid to be the greateſt Depth of the Mines. But what is that to the Depth of the Earth, whoſe Semediameter is ſaid to be* 3600 *Mile. Wherefore, to tell the Truth, we* *know the Body of the Earth only ſuperficially, and not within: Yet 'tis lawful to judge, that 'tis neither a ſluggiſh nor unſhapely Body, nor yet that all its Dignity is plac'd in its outward Surface, as in Statues, but that its more beautiful Parts are inward; yea, we muſt think that 'tis ſo ſhap'd and figur'd by the Great Creator, as to contain a Specimen of the Vital OEconomy, and that the wonderful Functions thereof are perform'd in its Bowels, by a Law no leſs certain than unknown to us, eſpecially the Circular Motion of the Waters; of which, though they cannot be demonſtrated to the Senſes, yet by what appears outwardly, 'tis evident that the matter is ſo; neither has the Wit of Men ſtopt, till they had by all Art ſearcht into the State and Condition of the Subterraneous Regions, as far as could be. But ſeeing there is no other way by which we enter into the Earth, but by ſuch Aper-*

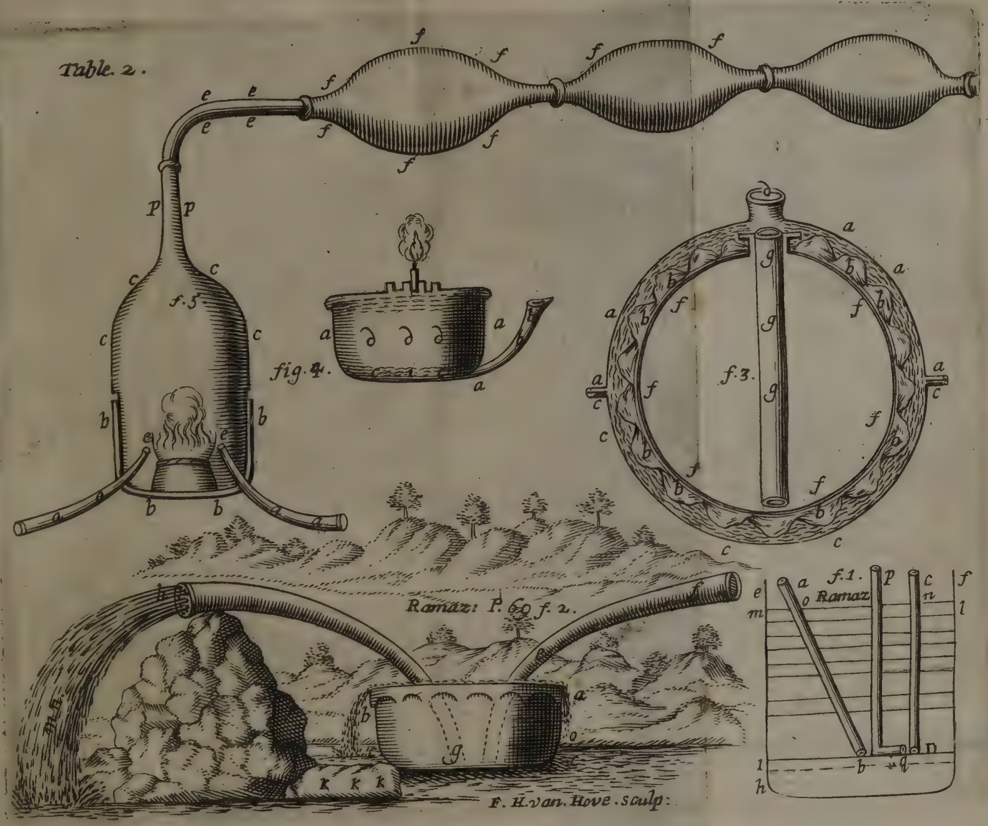
tures, as either Nature has made of her own accord, or by Mines and Wells, which the Covetouſneſs of Men has digged for Metals, or Neceſſity has put them on, for finding Veins of Waters; and ſeeing that in this City there is a frequent digging of Wells to a notable Depth, (as much as can be in a very plain place, and remote from Mountains) from which a wonderful Spring of Water riſes; I thought good therefore to examine theſe Secrets of Nature, and to communicate to the Profeſſors of Natural Knowledge, what I have obſerved of them, and my Thoughts thereupon, ſeeing none has Written of theſe things expreſly. I am not ignorant that ſome idle Men will ſpeak ill of me, and others will not be wanting who will accuſe me, as having ſpent my time about a thing of no moment: But that does little diſquiet me, ſeeing I have the Examples of the moſt Learned, who have been

been taken up with the moſt minute things, of whom Virgil *ſays,*

In tenui labor, at tenuis non
gloria —

But I can Anſwer ſuch Men with the Words of Seneca *treating of Natural Philoſophy,* You will ſay, what Profit is there in theſe things? No greater can be; To know Nature. Neither has the treating of this Subject any thing more beautiful, ſeeing it contains many things that may be uſeful, than that its Greatneſs takes up a Man; nor is it followed for Profit, but for its Wonderfulneſs.

Table. 2.



F. H. van Hove . sculp:

Of the Wonderful Source of the SPRINGS of *Modena.*

CHAP. I.

The Structure of theſe Fountains is deſcribed, and the moſt curious things which appear in the Digging of the Wells, and when the Water ſprings up, are remarked.

WE may be bold to ſay that *Modena*, a moſt ancient City, which *Tully* has of old Dignified with the Title of the moſt Noble Colony of the *Romans*, has been well ſituated by its firſt Founders: For ſeeing it ſtands in a great Plain, ten Miles

diſtant

diſtant from the Foot of the Riſing Hills, it has ſuch a Situation, that, with the wholſom Temper of the Air, and a fruitful Soil, it has a great abundance of moſt pure Water, which neither can ceaſe through length of Time, nor be ever vitiated or diverted by the Craft of Enemies: For this City has under its very Foundations a great Repoſitory of Waters, or whatever elſe it may be called, out of which it draws an inexhauſtible Stock of Waters; and, which is very rare, is got at a very ſmall Charge; ſeeing for the getting of this Treaſure (for VVater, according to the Teſtimony of *Pindarus*, is the beſt of all things) there is no need of great ſtir, in digging through Mountains, or keeping a great many VVorkmen, as is uſual elſewhere, and ſuch as *Rome* formerly had divided, as *Frontinus* ſays, into Searchers, VVater-Finders,

ers, VVater-Bayliſſs, Conveyors, Diſtributers, and many other VVorkmen.

But that I may not keep the Reader longer in Suſpence, you muſt know for a certain Truth, which many Thouſands of Experiments have already confirmed, *That in any place within, or without the City, for ſome Miles round, one may open a Spring which ſhall conſtantly ſend forth moſt pure Water.*

And ſeeing every Citizen may take out of this great Stock, as much VVater for his private Uſes as he pleaſes, without fear of wronging the Publick, or being Fin'd for it: Therefore when any will have a Spring in his own Houſe, he calls ſome VVorkmen, and having agreed for the Price, which for the moſt part does not exceed the Sum of Forty Crowns, he ſhews them the place which he thinks moſt fit, and they without further conſideration dig a *Well* in a place mark'd out for them; and when they have come to the depth of about 63 Foot, they pierce the bottom with a great Auger, which when it has been driven down 5 Foot deep, immediately the VVater guſhes out with ſo great Force, throwing up Stones and Sand, that almoſt in a Moment all the VVell is filled to the top, and the VVater flows out thence conſtantly.

Moreover, that which in digging theſe Wells gives the greateſt Trouble to the VVorkmen, is, the great abundance of VVaters flowing from the ſides, by which they are ſometimes much troubled, till they come to the depth of 28 Foot, where firſt the Potters Clay begins to appear: And therefore to keep off theſe VVaters which are none of the cleaneſt, when they firſt break Earth, they make a VVell pretty large, drawing out the VVaters that flow together on every ſide, till they come to the Bed of Clay; then they build upon it, as on a ſolid Foundation, a VVall round about of Lime and well-burnt Bricks, made for the purpoſe, that ſo the VVell may be narrower; and they carefully plaſter the outer Surface of it with Clay, well wrought, preſſing it with their Feet; and thus they continue to do till they come to the Surface of the Earth: For by this means they hinder the Influx of VVaters from the ſides, which being done, as if all were ſafe, and there were no more fear of the VVater coming from the ſides, they carry on their digging to the lowermoſt place ſo ſucceſsfully, that from the appearing of the Clay, they obſerve no more water to drop; yea, which is wonderful, they are forc'd ſometimes to moiſten the Earth with VVater, that it may be more eaſily digged.

'Tis alſo no ſmall Diſadvantage to the Diggers, before they come to the beginning of the Chalky or Clayie Ground, that the ſoft Earth falls in upon them by the Force of the Side-VVaters; which Impediment is not overcome but with great Labour: But when at length they come to the Bed of Clay, and from thence to the greateſt Depth, there is nothing to hinder them from getting by the uſual boring the uſual Eruption of VVater. For no Caſe is remembred in any place whatſoever within the City, or without the City, for ſome Miles, in which upon opening a Hole, and giving Vent to the incloſed VVaters, they did not immediately ſpring up on high. For the Diggers do with as great Aſſurance and Confidence faſten down their Augers in the bottom of the VVells, as one being to draw VVine, would pierce a Hogſhead when 'tis full. I was often preſent when this Phlebotomy, if I may ſo call it, was practis'd; and I always obſerved the VVater to break out almoſt with the ſame Force, which at the firſt is muddy and full of Sand, but the next Day it appears clear enough. But when the VVater has broke out, and the Borer is pulled out, ſitting on the Arms of the Auger, immediately two or three VVorkmen that are about the Mouth of the VVell draw out the VVater with all poſſible Diligence; for ſeeing at that time the Force of the VVater drives out much Sand and Gravel; they ſay that by this means the Courſe of the VVater is promoted, and the VVells are made to ſend forth VVater more plentifully; neither can the Stuff ſettling to the bottom ſtop the Hole. The Diggers of the VVells ſay, That ſome new-made Fountains have thrown up ſometimes ſo much VVater with the Gravel and Sand, that the Ground giving way on every ſide, and threatning the Ruine of the adjacent Buildings, they have been forc'd to fill up the Fountain again with Earth and hewn Stones. But the Pebble Stones, which are thrown up by the force of the VVater, differ not much from thoſe which are ſeen in the adjacent Rivers; neither are they ſmall, but ſome of them weigh 3 or 4 Ounces: Some of theſe are adorn'd with Veins of Gold, and pretty hard; others are harder, and like the Rudiments of Pebble Stones. In ſome places where the Situation of the City is lower, the VVater ariſes above the Plain, from whence it runs eaſily down, but in higher places it ſtops below the Surface of the Plain ; ſo that 'tis neceſſary to make Conduits under Ground, thro' which it falls into the publick Canals, which afterwards meet into one Canal that is Navigable, and by which they Sail conveniently enough even to *Venice*. For this Canal falls into the *Scultenna*, and the *Scultenna* into the *Po*.

The Number of theſe Fountains is very great, ſo that now almoſt every Houſe has one ; and their Numbers being increas'd, the old Fountains become fewer, as may be ſeen in the moſt Illuſtrious Family of the *Sadalets*, now belonging to the *Caſtelvitrys*, where the Pipes that now ſend forth no more VVater, are higher than thoſe that at preſent do. Theſe Fountains alſo are in the Gardens about the Town, and in the adjacent Villages, ſome of which riſe above the Surface of the Earth.

Moreover, the Diggers of the VVells ſay, that they have on Trial found them ſeven Miles from the City, beyond *Scultenna*: For having made an hole with an Auger, they ſay the VVater did boil up freely enough, throwing up Sand and Gravel. VVherefore the Limits of this hidden Spring are not known enough; yet 'tis reaſonable to think, that it is extended farther from Eaſt to VVeſt, than from North to South, ſeeing in this Tract they are not found extended above four Miles.

This is remarkable, that when the Hole is bor'd, and the VVater begins to break out, the next Fountains ceaſe from running for ſome time; yet after a little time they run again. I have been told by a Perſon of Credit, that when a VVell was bor'd in the Cloyſters of the Nuns of St. *Francis des Sales*, he ſaw in another VVell near it the VVater ſunk in a moment, which afterward aſcended, till both the VVells being in an Equilibrium, the VVater ſettled in the ſame Horizontal Surface. I have often obſerved this Decreaſe, but not with ſo great Swiftneſs, in which the VVater did not ſink ſo deep on a ſudden, but rather by degrees; and raiſing a few Bubbles, I obſerved it to decreaſe; but when the new *Well* was filled, it roſe again to its former height.

Having often underſtood by the Diggers of the *Wells*, that they heard a great noiſe of the water running under the bottom of the *Wells*, and that when it firſt begins to be heard they take it as a ſign, that 'tis time to Bore. To be aſſur'd of this, I went down into the bottom of a *Well* in the beginning of *February*, holding a lighted Candle in my Hand, the *Well*

Well being built in a place of no great light; having ſtaid there a little, I perceived a manifeſt Murmur and Noiſe, yet not ſuch as I expected. Then I ſtampt on the Ground with all my force, upon which the Ground made a hideous Noiſe, ſo that I thought I had to do with Hell, and therefore quickly gave notice to thoſe that were above, to pull me up with all poſſible ſpeed, remembring that once the force of the Water throwing up the Earth prevented the boring. But though I did not ſtay long there, ſeeing nothing beſide occurred to be obſerved but the noiſe of the Water, yet I felt ſo great a Heat there, that I did run down in Sweat; and it was no ſmall Pleaſure to me to obſerve, when I was drawn up from that Thermometer, in ſo ſmall an Interval of time, ſo many gradual Changes of Heat and Cold. At another time I try'd what was the temper of theſe *Wells*, in their greateſt Depth, by letting down a Thermometer in the midſt of Winter, and I found that it differ'd little from the Heat of the Dog-days in our Climate. The Diggers perceive no leſs Cold in the Summer-time in theſe *Wells*, and upon that account they refuſe to undertake ſuch a work in the middle of Summer; ſeeing, beſide the great Cold which oppreſſes them, ſuch a difficulty of breathing alſo ſeiſes them, that they are almoſt ſuffocated; a great quantity of Smoke riſes likewiſe at the ſame time, ſo as to put out the Candles, which never happens in the Winter, for then they breath eaſily enough, and the Candle ſtands unmoved. The Diggers complain much of a bad Smell, when they dig in the *Wells* in a hot Seaſon; eſpecially when they light on Stumps of

Trees: For the rotten wood ſends forth a moſt vile ſtink, which in the Winter-time they do not experience, though at that time they perceive a great Heat in theſe *Wells*.

But ſeldom are theſe *Wells* digged, in which they do not meet with ſeveral ſorts of Trees, as Oaks, Walnut-trees, Elm, Aſh, ſome of which ſtand upright, and ſome lie along. But it appears not by any Mark, that they have been cut by Men's Hands; and therefore we muſt think that theſe Woods were only the Habitations of wild Beaſts in former times. Theſe Trees when they are cut by the Diggers are ſoft enough, but when they are expoſed to the Air, they grow hard like Coral.

When they were making ſuch a *Well* as this in the middle of *April*, I obſerved the riſing of ſuch a ſmoaky Exhalation, that the Digger

ger could ſcarcely be obſerv'd in the bottom; who alſo ſaid he was very cold, and that he could hardly breath; and at the ſame time was troubled with a Cough: But when the Air on a ſudden was changed to Cold, immediately the ſaid Exhalation evaniſht, and the Digger could breath freely enough; and he ſaid, he felt a moderate Heat. Being to try what Temper theſe *Wells* were of in the Months next to the Summer, I went down into a *Well* which a French Jeweller was digging in his Houſe about the end of *May*, before it was bor'd, and I found ſuch degrees of Cold, as are obſerv'd in this Climate about the beginning of Winter. During the time that I ſtaid there my Cheſt and my Breaſt was ſo ſtraitned, that my Heart did pant very much. I did not perceive a great noiſe of Waters in this as in others, yet the Ground being beat, did give a frightful Sound as before.

While I was writing this, I thought fit to try the Temper of the Subterraneous Air in a *Well* that was then digging, by letting down into it at the ſame time a Thermometer and Barometer to ſeveral Depths, and marking the difference that is between the open Air, and that which is in the *Wells* when they are a digging; and eſpecially in the Summer Months, in which the Workmen ſeldom undertake ſuch a buſineſs, by reaſon of the Inconveniences afore-mentioned. Wherefore I have ſet down the following Table, that it may be better known what is the difference between the Subterraneous and the Open Air; which would be alſo very convenient and curious, if try'd in the VVinter-time: But I do not doubt but the quite contrary things happen then, which I will try with the firſt opportunity.

The 12 day of *June.*	The 23 day of *June.*	The 27 day of *June.*	The 1 day of *July.*
The height of the Liquor in the Thermometer without the Well, *G.* 80.	The height of the Liquor in the Thermometer without the Well, *G.* 77.	The height of the Liquor in the Thermometer, *G.* 74.	The height of the Liquor in the Thermometer without the Well, *G.* 78.
In the Well to the depth of 18 Feet, *G.* 64.	In the Well to the depth of 30 Feet, *G.* 51.	In the Well to the depth of 45 Feet, *G.* 44.	In the greateſt depth of the Well, *G.* 40.
The height of the Mercury in the Barometer, *G.* 80.	The height of the Mercury in the Barometer, without the Well, *G.* 80.	The height of the Mercury in the Barometer, without the Well, *G.* 78.	The height of the Mercury in the Barometer, without the Well, *G.* 79.
In the Well to the depth of 15 Feet, *G.* 82.	In the Well to the depth of 30 Feet, *G.* 84.	In the Well to the depth of 45 Feet, *G.* 85.	In the greateſt depth of the Well, *G.* 86.

'Tis alſo fit to be known, that no Force of Man is able to drain ſuch *Wells* dry: For if the Water ſhould be drawn inceſſantly with great Buckets, it were very much if the Water ſhould be depreſs'd 6 or 8 Feet; the more the Water is drawn out, theſe Fountains run more briskly: So that if it happen at any time, that any of theſe flow ſomething ſlowly, they draw out the Water as faſt as they can; and by this kind of Remedy (even as in Men's Bodies the Blood is taken away, that it may move more quick through its Paſſages) the Load being as 'twere taken off, they eaſily drive away the Sickneſs of theſe Fountains, which is their ſlowneſs of Motion. For the ſame end, they alſo either make a new Hole, or open the old one with an Inſtrument made of many wooden Cylinders, which they let down into the *Wells* with a great Auger faſtned in the end of it.

But theſe Fountains are ſubject to no other Fault; they maintain the ſame Purity of their Waters uncorrupted; and as in moiſt Seaſons they feel no Increaſe, ſo in the greateſt Droughts (ſuch as we obſerv'd in theſe laſt Years, in which the whole Region on this and the other ſide of the *Po* did exceedingly want Water) they ſuffer no Decreaſe. Moreover, theſe Waters are very warm in Winter, ſo that they ſend forth a Smoak; but in Summer they are very cold. Some Days after the Eruption is made, when the Water has ſetled, they uſually cover the *Well* with a Marble Stone, and as it were ſeal it, and afterwards convey the Water by Earthen Pipes from the ſame into Veſſels of Marble, or of Stone, from which afterwards the Water is, by other Conduits, continually diſcharg'd into the Publick Canals. This farther, is common to theſe Fountains, that all their Waters are in the ſame Horizontal Line, which is experimentally known by the Level; for tho' ſome of them aſcend above the Plain of the City, yet the greater part of them do not reach it; which happens only through the Inequality of the Situation of the City, which towards the South is higher, and more depreſs'd towards the North. Hence it comes to paſs, that they are almoſt all alike good, provided the *Wells* were right made at the beginning, and defended with Plaſter. A very old Fountain, near the Dukes Palace, is highly commended above the reſt, which they call the *Abyſs*, to which the common People come in the Heat of Summer to quench their Thirſt. 'Tis commended for this, that its Water being carryed into *Crete*, was brought back to its Fountain uncorrupted and pure; when at the ſame time the Water of *Nuceria* did not keep without Putrefaction.

But there remains ſomething in this Affair yet more worthy of Enquiry, *viz.* That the Depth of this great Receptacle might be try'd at the Hole made by the Auger; for the common People ſay many things of its great Depth, and the great Swiftneſs of the Waters. They ſay, that an Iron Rod being let down by the Hole, was ſnatcht away by the Violence of the Waters; and that the Auger when they bore is turned towards the Eaſt, of which I often ask'd thoſe that pierced the bottom, but could learn nothing certain of them. I therefore often try'd this Ford by a Plumet let down by a String into the Hole, that the Auger had made, and I not only perceiv'd that no Violence was offer'd to the weight ſunk, but I manifeſtly perceiv'd the bottom; neither could I perceive any greater Depth than what the Augur had made. It is altogether unknown who was the firſt Finder out of theſe Fountains, and at what time that hidden Receptacle of ſo great a quantity of Waters was diſcovered. I would not have any to think, that I deſign to give this Secret of Nature as a new thing; for it may be, the Original of theſe Fountains is as old as the City it ſelf, which is reckon'd among the moſt Ancient. I have often enquir'd of Old and Learned Men, whether they had any Tradition of their Anceſtors about this matter, but could learn nothing; yet we may probably conjecture, that this prodigious Spring of Waters, the like of which I never knew to be found any where beſides, has been known time out of mind; ſeeing the Maſons digging the Earth for the Foundation of Houſes, fall often upon great Leaden Pipes, buried amongſt the Rubbiſh of the formerly ruin'd City.

Once asking of one, famous for the digging of theſe *Wells*, whether he knew or heard from any who was the Finder of theſe *Wells*. He anſwer'd, He knew no other Finder than Neceſſity the Miſtreſs of all things. For ſeeing, ſays he, the Waters of the common *Wells*, which do not flow from this deeper Source, are vitious and unwholſom, Neceſſity alone compell'd them to ſeek for more wholſom Water by digging deeper; and when they came to this depth, in which the noiſe of this murmuring Water is more ſenſibly perceiv'd, they open'd a way to theſe Waters by the help of an Auger. To which perhaps he would allude; who put for the Arms of this City two Augers, with this Inſcription, *Avia, Pervia.*

The things that occur in the digging of the *Well* are no leſs curious and worthy to be known. Firſt, From the Surface of the Ground to the Depth of 14 Feet, nothing but hewen Stone, and the *Veſtigys* of an old City appear; for in this depth, Cauſeways of Flint, Tradeſmens Shops, the Pavements of Houſes, and checker'd works are obſerved every where; in which one may wonder, how the Ground has grown up to ſuch a height, which certainly cannot be attributed to the Cities being often deſtroyed, and afterwards rebuilt on its own Ruines, whereby it might have acquir'd a greater Height; for the adjacent Lands have the ſame Height; yea, the Town appears more depreſt than they. Below the Stones and Rubbiſh the Earth appears ſolid and compact enough, ſo that one would take it to be Virgin Earth; and a little below that, it appears marſhy, fenny, and full of ſuch Reeds as grow in Fenns. I remember that I have obſerved in one of theſe *Wells* 24 Feet deep, a ſtalk of VVheat yet intire; and in another 26 Feet deep a Hazel-tree, with the Nuts yet whole; ſo alternately to almoſt 6 Feet there is obſerv'd a different Change of Soil, ſometimes white, and ſometimes black, with the Branches of ſeveral Trees and Leaves, like thin Scales, and the Rind upon them, till they come to the Plain of Clay, which is firſt ſeen in the Depth of 28 Feet. VVhen the VVorkmen come to this, being now ſecure from being any more troubled with an Influx of VVater, they go on digging to the loweſt with great eaſe. The neſs of this Bed of Clay is about 11 Feet, and ſometimes 'tis full of Cockle-ſhells ; it ends therefore about the depth of 39 Feet ; after that there appears another Bed of marſhy Earth, about 2 Foot thick, compos'd of Ruſhes, Leaves of Plants, and Branches. This marſhy Bed being taken away by the Diggers, another Bed of Clay of the ſame thickneſs with the former, preſents it ſelf, which terminates in the depth of about 52 Foot; which being digg'd up, another Bed of marſhy ground, not unlike the former, is ſeen ; which being removed, another Bed of Clayie Ground of the ſame nature with the former two, but not ſo thick, appears ; which lies upon another Bed of marſhy Earth, which at laſt terminates on that laſt Plain, in which the Auger is fix'd, which is ſoft, and ſandy, and mixt with much Gravel, and ſometimes full of Sea-Products. Theſe ſeveral Beds, with their Intervals,are obſerv'd in all the *Wells*, as well within the Walls of the City, as in the Suburbs, in a conſtant Order.

Seeing in digging they often fall on Stocks of Trees, as I have frequently obſerved, which gives great trouble in the boring, to the Undertakers, 'tis a manifeſt Proof that this Ground was once expos'd to the Air; but I could never obſerve thoſe Stocks of Trees in the Beds of Chalk, but in the marſhy ones only, or in that ſpace which lies between the Foundation and the beginning of the Clay. There have been alſo found in the greateſt Depths of theſe Wells great Bones, Coals, Flints, and pieces of Iron. I do willingly paſs by many things here, which the common People report, of extraneous things caſt up by the Violence of the Waters at their firſt breaking forth, as Leaves of Oaks, Cheſnut, Millet, Bean-husks, and many other things; contenting my ſelf with telling thoſe things only of which I have been an Eye-witneſs, or have heard from Perſons worthy of Credit. Theſe are the things which belong to the Hiſtory of the *Wells* of *Modena*, and which I have obſerv'd as I had occaſion.

CHAP. II.

That theſe are not Standing, but Running Waters; upon this occaſion ſome things are brought in from the Hydroſtaticks.

SEing the Nature and Original of this hidden Source deſerves to be as much enquir'd into, as that of the *Nile* did formerly, let us paſs through theſe Subterraneous VVaters with the Sails of our Reaſon, ſeeing we cannot do it otherwiſe. Firſt, we may freely affirm, That theſe Waters are not ſtanding, as they are when ſhut up in a Hogſhead, but are in continual motion, and that pretty quick: For the Noiſe of that water which is heard before the Perforation in the bottom of the *Wells* does make it manifeſt enough.

Neither can any object that even ſtagnant VVaters are ſubject to great Commotions, as is known of the *Vulſinian* Lake, *Thraſumenus* and *Benacus*, of which the chief of the Poets ſays,

Teque adeo aſſurgens æſtu, Benace, marino!

O Benacus, *which like the Ocean roars!*

For that is not conſtant; yea, theſe Lakes for the moſt part are very ſtill: But the Noiſe of the VVater before the Terebration is conſtantly heard, which I always perceiv'd diſtinctly as oft as I deſcended into theſe *Wells*; and to this agree the Undertakers of theſe *Wells*, who by the noiſe of the VVaters gueſs that they have done with digging. But ſeeing the VVater riſes ſo ſuddenly to the height of

68 Feet, caſting forth Sand and Stones with force, 'tis moſt certain that theſe Subterraneous VVaters deſcend from a high place, and are continually preſt on by others that follow. Neither do I think that ſuch a ſudden riſing of the VVater can be attributed to the weight of the ſuperincumbent Earth, which drives the VVater upward by its Preſſure. I know indeed, that VVater may be elevated above its Surface, when 'tis driven up by ſome force lying upon it; as *Scaliger*, writing againſt *Cardan*, demonſtrates, by the Example of a Cylindrical Veſſel with Pipes on both ſides, and a Plug fitted exactly to its Capacity; into which, being full of VVater, if you force down the Plug, it will raiſe the VVater in the Pipes, above the Surface of the VVater that is in the Veſſel. But if, by the weight of the incumbent Earth, theſe VVa-

ters were elevated, the Earth ſo ſuperincumbent would be broke off from the reſt, which is altogether improbable, there appearing no Marks of it. Beſide, by what way could it come to paſs, that theſe Waters ſhould be ſo excellent, as to ſurpaſs all others, if they were without Motion, and kept as it were captive? For every body knows, that ſtanding Waters do no leſs differ from thoſe that are moved, than dead Bodies differ from live ones, ſeeing we commonly call ſuch as run *Living Waters*. Theſe Waters therefore do move, and ſtand not ſtill here, but run down conſtantly either to the Sea, or are ſwallowed up in ſome Gulph.

But whilſt I conclude theſe VVaters to be running, an Objection of no ſmall Value does occur, and 'tis this: If the VVaters run away ſo violently, there ſeems to be no

Reaſon why theſe *Wells* being digged, they ſhould riſe upwards. But it may be demonſtrated by a Phyſical Experiment, that the Water cannot aſcend in ſuch a caſe. For let there be a Veſſel full of Water, at whoſe ſide near the bottom, a Pipe is inſerted at right Angles pierc't with many Holes, *EFG* ; and in the lower part let it have a Slit, *HI*. If now you give the Water free vent to run out, not only it will not aſcend at the Holes, but neither will it deſcend at the Slit, but will all run out at the wide Mouth of the Pipe; and it will be pleaſant to ſee the Water hang out at the Slit, and not fall, (till at the latter end) the Veſſel being almoſt empty, the Water will no more run out at the wide Mouth, but will all run down through the Slit.

Fig. 1.

If therefore this Experiment hold, the ſuppoſed running of the Waters

ters to places farther off, and their manifeſt aſcent into theſe *Wells* at the ſame time, ſeem not to agree with the Laws of Hydroſtaticks: For if they flow freely, and without ſtopping, without doubt they cannot riſe on high; which is confirmed by what the moſt Learned *Scaliger* ſays in his *Exercitations*, who, enquiring whether VVaters may run under other waters, ſays, That near the River *Oltus* there is a *Well* on a high Hill, and that at the bottom a Stream runs ſwiftly and with great Noiſe.

Exer. 100.

Altho' all this ſeems to be true and obvious to the Senſes, yet the further Progreſs of theſe waters may in our caſe conſiſt with the riſing in theſe *Wells*, which may be demonſtrated in the ſame Firſt Figure. For if you put your Finger to the Mouth of the Pipe *D*, yet ſo as not to ſtop it altogether, the

Water will leap out on high at the ſame time, by the holes *E*, *F*, G, and flow down by the Slit *H*, and withal at the Mouth of the Pipe, the one Action not hindring the other; and ſo according as there is more or leſs of the Orifice of the Pipe ſtopt with your Finger, more or leſs Water will be raiſed by the ſaid Holes; but it will never be rais'd to that height it would be, if the Mouth were quite ſtopt. It does not therefore diſagree with the Laws of Hydroſtaticks, if theſe Subterraneous Waters are running and go further, that at the ſame time they ſhould be raiſed to the height of 68 Feet in the *Wells*, yet ſo as not to exceed the height of the Ciſtern from whence they come, becauſe the Paſſage at which they flow out is not large enough.

'Tis convenient that ſome Account be given of theſe Phænomena, obſerv'd hitherto by none that

I know, ſeeing there is no part of Philoſophy more curious, yet leſs cultivated, than Hydroſtaticks. Firſt therefore, 'tis no wonder that the Water (while it has a free Courſe and Paſſage through the wide Mouth of the Pipe) does not run alſo at the Holes; yea, of neceſſity it muſt be ſo: For the Water has a free Deſcent, neither does it meet with any Obſtacle to make it riſe, as it does in Pipes bended upwards; ſo neither will it deſcend by the Cleft, becauſe of the Preſſure and the Force it has acquir'd in deſcending, like a ſolid Body, which ſuffer it not to turn from its Courſe; in the ſame manner as Bodies thrown, are carried in a Horizontal Line for ſome ſpace, while the Force continues.

But the Reaſon why the Orifice of the Pipe being ſtraightned, the Water preſently leaps on high, and runs down through the Slit, in my

Opinion is this: That when the lower parts of the Water are preſſed by the upper (as the moſt famous Mr. *Boyle* has made evident in his Hydroſtatical Paradoxes) and are urged with Violence to run out, the Paſſage being ſtraitned, by applying the Finger to the Mouth of the Pipe; ſome of the Water when it cannot overcome the Obſtacle, ſeeks a Paſſage to it ſelf where it can: From whence it comes to paſs, that the leſs the Water runs out at the Mouth of the Pipe, with the greater Force it runs out at theſe Holes. But when the Preſſure is abated, and the Veſſel is almoſt empty, none runs out at the Mouth of the Pipe, but what remains, runs ſlowly through the Slit, being the ſhorter way.

From hence it appears, that the direct Preſſure muſt be eſtimated by the weight of the Pillar of Water, whoſe Baſe is equal to the Horizontal Surface it reſts on, and its Height equal to the perpendicular Depth of the Water. For Example: In a Veſſel conſtituted in a Horizontal Plain, any part of the bottom that can be aſſigned may be a Baſe to a Pillar of water of the ſame Height with the whole water in the Veſſel. And in the foregoing Figure, when it flows freely through the Pipe *C D*, 'tis preſt by a Pillar of water, which has the ſame Baſe with the Orifice of the Pipe *CD*; which Pillar of water forces it ſelf by a lateral Preſſure into the Pipe, and ſo to run out; by the force of which Preſſure it comes to paſs, that all the water in the Veſſel runs out by this Imaginary Pillar. Many things are ſaid of this Preſſure of the water by Hydroſtatical VVriters, to wit, that the under parts are preſt by the upper, and the upper parts are preſt by thoſe that are under. Moreover, they are preſt ſide-ways by one another; which Diverſity of Preſſures they endeavour to prove by ſeveral Experiments; and in effect, every one may experience this lateral preſſure in himſelf, when he is in the water up to the Neck; for he will feel a preſſure on every ſide, and ſome difficulty of Breathing, which yet is not to be thought to proceed only from the lateral preſſure of the water, but another Cauſe: For when the Expanſion of the Cheſt is neceſſary to Reſpiration, 'tis not ſo eaſily perform'd in the watery Element, as in the Air, by reaſon of its Groſsneſs: For as Fiſhes need a greater force for ſwimming, than Birds for flying, as *Borellus* demonſtrates, by reaſon of the groſſer Body of the water, which muſt be moved out of

De motu Anim. P. I. prop. 215.

of its place, and circulate into that left by the Fiſh: So a Man ſunk in the Water up to the Neck, needs a greater force for opening his Cheſt, than if he were in the Air. And from hence it is, that Inſpiration in the Water is more difficult than Expiration. *This happens only becauſe the preſſure is unequal; for the preſſure of the Pillar of Air and Water on the Cheſt without, exceeds the preſſure of the Pillar within the Cheſt, that is only of Air, ſo much as the weight of the Pillar of Water which covers the Cheſt, exceeds the weight or preſſure of the Pillar of Air within the Lungs, and of the ſame height with the Water about the Cheſt; for Fluids preſs only according to the perpendicular heights, and not the groſneſs of their Pillars, as is plain in Syphons, in whoſe Legs, tho' of different thickneſs, the Liquor riſes but to the ſame Horizontal Height.*

Likewiſe all do agree, that not only the bottom, but alſo the ſides of the Veſſel are preſt; which preſſure ſome ſay is conſiderable, but others not. *Tho. Cornelius* thinks it to be equal to the perpendicular Preſſure: For ſuppoſing the Water to preſs by inclin'd Lines, and that a Body ſliding down by inclin'd Lines, acquires as great a Velocity as if it fell down by a Perpendicular, equal to the height of the Plain, he thinks the lateral Preſſure to be equal to the Perpendicular. On the other Hand, *Becher*, in his *Phyſica Subterranea*, ſays, That the Water preſſes directly on the bottom, but far leſs on the ſides; which Conjecture he grounds on this, That the little Ramparts of Earth ſuſtain the Preſſure of the Ocean it ſelf, that it overflows not the adjacent Fields; yea, he endeavours to make it out by a

Mechanical Experiment, that the Preſſure of the Water is only upward and downward.

If Mr. Becher *had conſidered that Hydroſtatical Axiom*, viz. *That Fluids preſs only according to their perpendicular Altitudes, he would not have been frighted by the Extent of the great Sea at* Amſterdam, *from owning ſo evident an Hydroſtatical Truth as this is, That the Lateral Preſſure of Fluids is equal to the Perpendicular: For ſuppoſe the Banks there to be Three Fathom, or Eighteen Feet, above the* Harlem Meer, *and the adjacent Lands, which they defend from the Inundation of the Sea, and that the weight of every Cubical Foot of Water is* 76 ℔. 9 ℥ ½, *and* 48 gr. *this multiplied by* 18 *f. the Perpendicular Height will amount to* 1381 ½ ℔, ℥ 1. *g.* 384. *which is the Weight or Lateral Preſſure that lies on a Square Foot at the*

the bottom, which a Rampart of Earth, made ſtrong for the purpoſe, and 100 *Foot thick, may be well allowed able to ſupport. 'Tis true, this Computation is made for freſh Water; but the addition of Salt in the Sea-water, which is about* 1 ℔ *of Salt to* 41 ℔ *of Water, will not ſo much alter the Reckning.*

For my part, as I do not believe the lateral preſſure of the VVater to be equal to the perpendicular, ſo I do not think it deſpicable; for it may be ſhown, that the lateral preſſure is leſs than the perpendicular, by taking notice of this only, That there is a greater Endeavour of the VVater to deſcend by a perpendicular Line than an inclin'd one: But ſuppoſe that ſome parts in the ſides of the Veſſel ſuffer a preſſure, equal to the perpendicular preſſure, as are theſe which be at the bottom, and in which thoſe inclin'd ones would end, which have the ſame Depth with the whole VVater; yet in other parts the lateral preſſure cannot be admitted ſo great.

The Author here ſeems like one groping in the dark for the Truth, and yet when he has got it between his Hands he lets it ſlip: For he ſuppoſes, that the Preſſure by inclin'd Lines is, at the bottom, equal to the Preſſure by Perpendicular Lines; yet he will not own the ſame in the intermedial parts. Indeed the Preſſure by Inclin'd Lines in the intermedial Parts is not equal to that Perpendicular Preſſure which is at the bottom; but 'tis equal to that perpendicular Preſſure which is on the ſame Horizontal Surface, which may be made evident thus: Take a Glaſs Tube, ſuch as they uſe for Baroſcopes, but open at both ends, a b; *ſtop the upper end* a *with your Finger, and ſo immerſe it into the Veſſel*

ſel e f g h, *filled with Water to* m l, *inclining, till it come to the Horizontal Surface* i k, *and then take your Finger off, the Water will riſe by the Preſſure at the Orifice* b, *till it has come to the Surface* m l, *which is the ſame height it would have come to if the Pipe had been Perpendicular, as in* c d. *Farther, Suppoſe a Pipe bended in the end at the right Angles* p q, *immerſed to the ſame Surface* i k, *as before; upon taking away your Finger from* p, *it will riſe up as high as before, to the Surface* m l: *Now 'tis evident to any that conſiders the Figure of the Pipe, that the Preſſure at* q *is Lateral, and as forcible as if it were Perpendicular: This may be made more pleaſant to the Eye by putting Oil into the Pipe, as the Honourable Mr.* Boyle *ſhews in his* Paradoxa Hydroſtatica, *Paradox.* 7.

And yet 'tis not to be thought ſo little of as *Becherus* ſays; for ſeeing the ſides of Veſſel are no ſmall hindrance to the Fluid that it deſcends not, the Force which the Fluid exerces on the ſides cannot be ſmall.

Seeing then, as was before ſaid, the parts of a Fluid are crowded on one another, as if they were in a Preſs, 'tis not without Reaſon that Moderns from this do fetch a Solution of that old, yet difficult, Problem, which has wearied ſubtile VVits, VVhy a Diver, in the bottom of the Sea, is not appreſt by the incumbent VVater. They commonly ſay that it happens, Becauſe the Diver is lifted up by the water under him, and on the ſides the parts of his Body are preſt with the ſame force; neither can they be driven inward, ſeeing all is full; ſo that there is no fear of the Luxation of a Member, or painful

Compreſſion. Yet the moſt ingenious Mr. *Boyle* thinks the Difficulty is not anſwered enough; for though by reaſon of the equal Preſſure of the Ambient Fluid, there follows no Luxation, yet there appears no Reaſon why there is no Pain felt by the compreſſion of the Parts one againſt another. VVherefore the ſame Author recurs to the ſtrong Texture of the Animal, which can reſiſt the Preſſure.

It might be ſolv'd thus. There is an Air lodged in the Pores of all Animal Juices, which two together keep diſtended and full the Fibres, which are tubulous, as Sir Edmund King *has very ingeniouſly diſcovered long ago; and it is by the Preſſure of the Ambient Fluid (which is equal on every ſide) that this Air being forc'd into leſs Compaſs, the ſides of the Fibres come cloſer together, which cauſes no more pain to the Fibres, than the Bladder, (which yet is a very* *ſenſible part) ſuffers upon its being contracted, when the Urine is expelled.*

If it were not Raſhneſs to think any thing can be added to the Reaſons of ſo many moſt famous Men, I would ſay, that ſeeing the Body of a Living Man is ſpecifically lighter than VVater, tho' not much; and therefore being more preſt by the Collateral VVater, according to the Principle of *Archimedes*, the Syphon in which the Diver is that is leſs preſt ought to be lifted up, and therefore he ought to feel no Preſſure. But becauſe the Diver under water may be diverſly conſidered, either as he deſcends by a perpendicular Line, or aſcends by it, or is moved by inclining Lines, or as being faſtned to the bottom, and ſticking on a Rock, he remains immovable; in any of theſe caſes he cannot be ſubject to a dolorous Preſſure. I have learned from a skilful Diver, that when a Swimmer will deſcend perpendicularly, and go to the bottom in a ſtraight Poſture, he drives the water upward with his Hands as with Oars; and when he will riſe again, driving the water with his hands towards the bottom, he returns the ſame way. From whence it comes to paſs, that ſuch as are unskilful in Swimming, when they ſtrike the water contrary ways, are ſtifled. It is worth the while to enquire into the Reaſon of theſe Effects, having never ſeen them in any Author, tho' there were need of a *Delian* Swimmer here, as they ſay.

I think then, that when a Swimmer drives the ſuperincumbent water with his hand upward, he therefore deſcends; becauſe ſuch a Syphon being ſo ſmitten is leſs preſt, and therefore is lifted up, the other being depreſt in which the

Swimmer is; juſt as in a Scale ſuſpended, and put in an Æquilibrium, if one of the Scales be hit below, that will be lifted up, and the other of neceſſity will deſcend. Therefore the Body of the Swimmer being put in the Pillar that is more preſt, will of neceſſity deſcend; but when at the ſame time he does this with both hands, he makes his Deſcent more eaſie.

But when he will riſe perpendicularly, and in a ſtraight Poſture from the bottom, by ſtriking the water with his hands toward the bottom, he makes that Syphon more preſt; and therefore the Swimmer being plac'd in the other, muſt of neceſſity aſcend: Juſt as when the Scale is put in an Æquilibrium, if I hit the Scale in the hollow part, that will be depreſt, and the other lifted up. The ſame Reaſon holds, when he aſcends or deſcends by Lines inclin'd to the Horizon. Therefore whether he aſcend or deſcend, or whatever way he move, he ought to be under no dolorous Preſſure, how deep ſoever the Water be. For ſeeing, according to the moſt ingenious *Borellus*, Bodies do not appear heavy but when they are in reſt; as appears in an Example given by him of two Sacks of Wool, one of which being put on the other, does not exerce its weight, or preſs it, but when 'tis reſting, and not when it deſcends.

Therefore the Swimmer deſcending in the Water perpendicularly, ought not to ſuffer any Preſſure in the VVater deſcending with the ſame Swiftneſs. But when he is carry'd up by the ſame way, ſeeing by his Body he thruſts upward the VVater lying upon him, which he does not by his own Strength, but by the help of the

Collateral Syphon, and therefore needs no help of his Muſcles to overcome the Reſiſtance of the ſuperincumbent VVater; neither ought he to have the ſenſe of a dolorous Preſſure, to which the Circulation of the Ambient Fluid coming in behind, does not a little contribute, by not ſuffering any part of the Body to be mov'd out of its place. Upon the ſame Account he ought not to feel any dolorous Preſſure, if he aſcend or deſcend by inclin'd Lines, or ſtick without Motion to the bottom: For the other Collateral Syphon being more preſt, does always exerce its Force, and the ſubjacent VVater lifts up the Diver, that is ſpecifically lighter than its ſelf upward.

The Author here ſuppoſes the Body to be ſpecifically lighter than Water, which I judge to proceed from the Air incloſed in the Cheſt; for when

when that is out, the Body ſinks by its own weight; and this gave perhaps the firſt riſe to Anatomiſts to diſcover whether a Child was Still-born, or not; for if its Lungs do ſwim in the Water, 'twas not Still born, but has breathed the Air; but if they ſink, then they conclude the Child to have been Still-born. As for the Divers riſing or falling by the Motion of his Hands, 'tis the ſame Caſe as in an Oar, when the Blade of it moves with greater force than the Water, it makes reſiſtance to the Oar, which therefore not advancing, the Boat of neceſſity muſt: So when a Man preſſes the Water quickly downward, it makes reſiſtance to his Hands; and therefore the Water not giving way faſt enough, the Body muſt be thruſt upward; juſt as in the Air, if a Man between two Chairs did forcibly thruſt them down with his two Hands, he muſt be lifted up, because they do not give way. The Author ſays, the

Preſſure is not felt when the Diver is aſcending or deſcending, becauſe the Water being in motion, does not preſs upon the Body: But it might be made manifeſt that it does; and Experience makes it beyond Contradiction, that they feel no Preſſure when the Water is at reſt; and the Divers do own, that they feel a Preſſure rather in the going down in the Diving-Bell, than afterward; as the Honourable Mr. Boyle *told me he had communicated to him by the Laird of* Melgum, *who practis'd this way of Diving, in theſe Words;* The Compreſſion of the Air being ſuch, as going down did hurt me; but below, and ſtaying there, was as familiar to me as that above.

CHAP. III.

That theſe Fountains cannot be derived from a Subterraneous River.

SEing then that it is clear enough from what was ſaid before, that the flowing of theſe VVaters toward the Sea, may conſiſt with their riſing here; and in any place, it ſeems to follow, that there is a great ſubterraneous River under it, from which theſe Fountains do ſpring: And truly this is the common Opinion among us, which yet I cannot aſſent to. I am not ignorant, that there are ſome Rivers that hide their Head under Ground, and after ſome time do riſe again. Some again there are that never riſe above Ground, as it happens in the Veins of the Body; ſome do appear in the Surface, and ſome do never. Of this *Seneca* ſpeaks very well. Nature governs the Earth as it does our Bodies, in which are Veins and Arteries; and Nature hath ſo formed it like our Bodies, that our Anceſtors have call'd them Veins. *Pliny* ſays, That the *Nile* is often ſwallowed up in Gulphs, and after a long time is ſpew'd up again. They report the ſame of *Niger*, a River of *Æthiopia*, which riſing out of the ſame Lake that the *Nile* does, and running towards the VVeſt, when it meets with a Chain of Mountains, it finds hidden ways; and appearing again on the other ſide of the Mountains, diſcharges it ſelf into the *Atlantick* Ocean. In like manner, *Tigris* in *Meſopotamia* being ſtopt by the Mountain *Caucaſus*, hides it ſelf under Ground, and is loſt in a great Cave; but afterward breaking out near to *Babylon*, is mixt with *Euphrates.* To ſay nothing of *Alphæus*, a River in *Achaia*, whom the Poets feign to paſs a great way not only under Ground, but alſo under the Sea it ſelf, and to riſe again in the Fountain called *Arethuſa*: This is known by the Offals of the Sacrifice, which being thrown down the River, were, every fifth Summer, at the time of the *Olympiack* Games, caſt up by this Fountain. And alſo the Seas themſelves are thought to communicate by occult Paſſages, as the *Mediterranean* with the *Red* Sea, and the *Caſpian* with the *Euxine*, as the moſt Learned *Kircher* makes out by good Conjectures.

Father Avril *a Jeſuit, in his Travels into* Tartary, *ſays, that 'tis more probable that it diſcharges its ſelf into the* Perſian *Gulph; of which this is his main Proof; That they who inhabit*

inhabit about the Perſian *Gulph, do every Year at the end of* Autumn *obſerve a vaſt quantity of Willow-Leaves: Now, in regard this ſort of Tree is altogether unknown in the Southern part of* Perſia, *which borders upon that Sea; and for that quite the contrary, the Northern part, which is bounded by the Sea of* Kilan, *or the* Caſpian-Sea, *has all the Sea-Coaſts of it ſhaded with theſe Trees; we may aſſure our ſelves with Probability enough, that theſe Leaves are not carried from one end of the Empire to the other, but only by the Water that rowls them along thro' the Caverns of the Earth.* So far Father *Avril.*

Who further, for eſtabliſhing a Circulation of VVaters from Pole to Pole, deſcribes a great VVhirlpool under the North Pole, of which alſo *Olaus Magnus* and *Helmont* have written, by which a great quantity of VVaters is abſorb'd, which falling into the Bowels of the Earth, is return'd by the South Pole.

Some ſay that this changes its Courſe once in half a year, going in at the South Pole, and coming out again at the North.

Tho' all this be true, ſuppoſing alſo that within the Bowels of this Earth there is exerciſed ſomething like an Animal OEconomy; and that one may, not without Reaſon, imagine divers Ebbings and Flowings of VVaters, ſeeing, as *Seneca* ſays, the whole Earth is not ſolid, but hollow in a great many parts; yet I cannot allow as ſome do, that this is a great broad River, from which theſe Fountains break forth. This Opinion of a great River has ſo firmly poſſeſt the Minds of all Men, that if a little Earthquake happen, the Inhabitants are in great Fear leſt the

Town, which otherwiſe is greatly ſhaken with Earthquakes, ſhould be ſwallow'd in a moment of time; imagining it to be plac't on the arch'd Roof of a great River.

I confeſs the Conjectures are not ſlight, on which may be grounded the Opinion of ſuch a Subterraneous River, which gives Water to theſe Fountains; eſpecially the Noiſe of the VVaters in the bottom of the Well before the Perforation, and the aſſurance Men have, that in every place where a Well is digg'd, Water will boil up, caſting up Sand, Pebbles, and many other things; which ſeem to evidence its being ſome great River, or at leaſt ſome great Receptacle. But one Reaſon, to wit, the ſuper-exceeding Greatneſs of this imaginary River, which muſt be admitted of Neceſſity, is of ſo great weight, that it overturns all Conjectures that would ſeem to confirm the Opinion of ſo great a River running under this Ground. For *Europe* has no River ſo big as this ſubterraneous River muſt be, to which neither the *Po*, nor the *Rhine*, nor the *Danube*, are to be compared. 'Tis known well enough by what we have before ſaid, and all the Inhabitants are convinced, that not only within the Compaſs of the City, which is a Mile in Diameter, in any place, may be made a Fountain, which will conſtantly ſend forth Water; but alſo without the Town for ſome Miles, without having any regard to the Situation, ſuch Fountains may be made, but eſpecially by the *Æmilian* way; as alſo beyond the River *Scultenna* a great plenty of theſe Springs and Fountains is obſerv'd. Therefore the breadth of this ſubterraneous River (unleſs its Courſe were along this way, in which caſe it would be extended 4 Miles) ſhould be extended 6 or 7 Miles.

But who can believe that under this Plain, on which this City is plac'd, a River of ſo great Extent ſhould continually flow, with ſo great a weight lying upon it! I will not deny, that from South to North the Source is not ſo much extended, ſeeing theſe Fountains are not obſerv'd above 4 Miles; which, whether it be for want of Experience, or that this is truly its Bounds, I dare not affirm. But if we will ſuppoſe a ſubterraneous River, which hath a Channel of 4 Miles, every one I think will doubt it: Nor will he ſo eaſily give Credit to this Opinion, eſpecially ſeeing this Arch that muſt keep up ſo great a VVeight 68 Feet deep, is not of Flint or Pumice-ſtone, but altogether made up of Earth gathered by degrees. Truly, if this Prodigy of Nature were ſituated in a Mountainous Region, I ſhould not be much againſt admitting the greateſt Subterraneous width. For if we take notice of the Caves and Subterraneous Receſſes which are fam'd in Geographers, we ſhall find them to be made amongſt the Rocky and ſteep Caverns of the Earth, ſeeing Rocks and Stones are the Bones and Strength of it. From whence *Ovid* ſays,

Magna parens terra eſt, lapides in
corpore terræ,
Oſſa reor dici ——

The Earth is our great Mother, and
the Stones
Therein contain'd, I take to be her
Bones.

VVe find the *Corycæan* Cave in *Cilicia* (of which *Pliny*, *Solinus*, and others write, that being a very large Promontory with a wide Mouth, and full of Woods within; 'twas 52 Miles broad, ſo as to be very light, and both a Cave and a Port) to have been plac'd in the Mountain *Corycus*. The River *Tigris*, which we have often mention'd, hides its Head, and as often riſes again, but only when he ſees himſelf ſtopt with a Chain of Mountains. For diſdaining that any ſtop ſhould be put to his Swiftneſs, from which he takes his name, he finds himſelf a way by the wide Bowels of the Mountains, and runs hid, till being ſwell'd with the acceſſion of VVaters, he runs out into the open Plain. The River *Timavus*, famous enough among the old Poets (about whoſe true place, whether 'twas near *Padoua*, or *Tergeſte* in *Iſtria*, there were ſo many Contentions among the Learned of the laſt Age, as may be ſeen in *Leander*, *Albertus*, *Bernardinus*, *Scardeomus*, *Johannes Candidus*) though he ſeem to draw all his Water from Nine Fountians, as Breaſts ſticking out in the Mountain *Timavus*, yet he borrows them from another place, *viz.* a Subterraneous River, diſcharging it ſelf by the Cavernous VVindings of the Mountains, into the Sea; for which he is ſo proud as to be called, the Father and Fountain of the Sea.

Seeing we have made mention of *Timavus*, and wonderful things are told of him by VVriters, *viz.* That he Ebbs and Flows according to the Motion of the Sea; and that he increaſes ſo much, as to overflow the adjacent Country; but in the ebbing of the Sea he runs gently enough, and carries with himſelf the Sweetneſs of his VVaters even to the Ocean, without mixture.

Ut Doris amara ſuam non intermiſceat undam. Ecgl. 10.

That Doris *mix not her ſalt Waves with thine.*

As the chief of the Poets did formerly ſay of *Alphæus*: Therefore I am willing to ſtop at the Contemplation of ſo curious things.

The moſt Learned *Kircher* does very well explain the Cauſe of this prodigious Increaſe, and how the River keeps its VVaters free from Saltneſs, even to its Mouth. For he ſays, That a great abundance of VVater is caſt out from the Bowels of a Mountain near a Village called *St. Cantians*, about 14 Miles diſtance from the Nine Fountains of *Timavus*, and that there 'tis ſwallowed up by a manifeſt Gulph, nor does it appear more: He thinks therefore, that the VVater being ſwallow'd up by hidden Channels, runs into the Sea; and that therefore in the flowing of the Sea, the Salt VVater drives back the Freſh that meets it with great Violence, as being of leſs Force; and ſo this Subterraneous River is ſtopt in its Courſe, which not finding room to which it may retire, breaks violently out at the foremention'd Fountains in the Mountain *Timavus*, communicating with the ſame Subterraneous River.

Unde per ora novem vaſto cum murmure montis,
It mare prœruptum, & pelago premit arva ſonanti. Æn. l. 1.

Whence through Nine Mouths a Sea from Mountains raves,
Which the whole Country drowns in foaming Waves.

By this means 'tis not hard to underſtand, how according to the Ebbing and Flowing of the Sea, there appears ſo proportionate a Viciſſitude of Ebbing and Flowing in *Timavus*, and yet the Waters remain freſh: For the Sea does not beat back the Waters of *Timavus*, nor ſtop his Courſe in the Surface, but meeting the Subterraneous River ſwallowed up in the foreſaid Valley, forces it to flow back, and throw out its Waters by theſe Nine Mouths; and from hence is the prodigious Increaſe of the River *Timavus*. But when the Sea ebbs, and gives leave to that Subterraneous River to run, *Timavus* alſo at the ſame time, when that great Regurgitation of the Water ceaſes, runs quietly enough, and with all his Sweetneſs, into the *Adriatick*.

Neither Kircher *nor* Falloppius, *determine what Sea they ſuppoſe to flow into theſe Cavities ; for the* Mediterranean *does not riſe high enough to anſwer the caſe, ſeeing it flows but a Foot at the moſt, which is in the* Adriatick ; *if they meant the* Atlantick, *which in ſome places is obſerv'd to riſe 9 Fathom, in many to* 2 ½, *to 3 or 5 ; yet perhaps that will not anſwer the caſe neither ; for it has a great way to come, before it can come to reach the place ; and when it has ſwelled to the height there, conſidering the Nine Mouths of* Timavus *are in a Mountanous Countrey, which may be juſtly ſuppoſed elevated far above the Sea when at the higheſt, this Solution of the* Phenomen *will not hold. It ſeems to me more rational to explain it thus : I ſuppoſe the Water comes from* St. Cantians, *to run under Ground in a Canal* e f, *which it fills quite (ſo that there is* *no paſſage for the Air that way) till it come to the Baſin* abc, *which it fills ſo, as to overflow into the Sea below, and that this Baſin is not much lower than the Mouth of* Timavus; *for thus the Aſcent of the Water into theſe Nine Mouths will be more eaſily procured. I ſuppoſe likewiſe, that this Baſin* abc *has another Paſſage* gh, *by which the outer Air communicates with the Water in this Baſin, and by which the Water in the Flux of the Sea runs out at* h; *then the Water that overflows and falls into the Sea when it is at the Ebb, becauſe the Air gets out at the Holes below near the Surface; when the Surface of the Sea* kkk *is elevated by the Waters flowing into this lower Baſin through Subterraneous Paſſages, and the Holes near its Surface (by which the Air got out before) being now ſtopt, the Air is crowded between the Surface* kkk *below, and that*

that in the Baſin, and thus acquires a greater Elaſticity than the Air that preſſes the Surface within the Pipe g h ; *and therefore, according to the Laws of Hydroſtaticks, the Water in that Pipe muſt aſcend: Now if the Sea flow two Fathom below, it may raiſe the Waters in the Pipes* g h *near as much, ſo that it may run out at* h. *I think, the flowing of Springs and Lakes, ſuch as the Ingenious Mr.* VValker *told me is reported to be found in* Cornwall *on the top of a Hill, and in other places, may be explained very well after this manner.*

Our Countrey-man *Falloppius* gives a Reaſon of this ſurprizing Phænomenon of Nature, not much differing from this, whoſe words I thought fit to add here: *But you muſt note, that although the River then abound with Water, yet that Water is freſh, as 'tis alſo when it*

decreaſes ;

decreaſes; for 'tis always freſh; but from whence does that come? You muſt underſtand, that in the Country of Carni *there is a Caſtle called* St. Cantians, *from whence riſes a great quantity of Water, which when it has ſcarcely appear'd, is ſwallow'd up by the Earth, and appears no more. Now the Village of* St. Cantians *is* 14 *Miles diſtant from the River* Timavus.

I believe therefore that the Water flowing from the Mountain in abundance, is the Cauſe of the Increaſe of Timavus; *for I think that this Water flows plentifully by theſe Subterraneous Paſſages, which meeteth with other ſecret Paſſages, by which the Sea runs into the Mountain next to the River; and that ſo there is a Congreſs made, and daſhing of the Sea Water againſt the other, which runs down from the Mountain farther off; and ſeeing the flowing of the Sea is more forcible than the freſh*

Water, (for the Salt Water is more groſs than the freſh) it happens that the freſh Water flowing from the high Mountains, yields to the other when it meets with it; from whence it comes, that when it cannot run to the Sea, it recoils up to the top of the Mountain; and from hence 'tis, that all the Mountain abounds with Water, and the Timavus *increaſes and decreaſes.*

Such *Phænomena* of Nature ſporting it ſelf, may be more eaſily obſerv'd in the Mountainous Countries than elſewhere, ſeeing the Mountains, becauſe of their ſolid Texture, have empty Spaces and Kettles, which ſerve not only for Ciſterns of Water, but alſo for Receptacles of Fire, as in *Sicily*; which therefore *Ariſtotle* calls, full of Caverns. So *Virgil*, deſcribing *Ariſtæus* going down into the ſecret places of *Pæneus*, a River in *Theſſaly*, running between *Olym-*

pus and *Oſſa*, wrote theſe Verſes.

Jamque domum mirans genetricis & humida regna,
Speluncisque lacus clauſos, lucoſque ſonantes
Ibat, & ingenti motu ſtupefactus aquarum,
Omnia ſub magna labentia flumina terra
Spectabat diverſa locis.——

In Engliſh thus:

He wandring goes thro' Courts, and Chryſtal Realms,
Loud Groves and Caves, which Water overwhelms;
And with tumultuous Waves aſtoniſht found
All the great Rivers running under Ground.

There are many of theſe Subterraneous Rivers in this and other Countries: There is one very remarkable

markable at Bourdeaux *in* France, *which runs under the Church of St.* Sorine; *and it ſeems under or near a Pillar of that Church, in which there is made a hole large enough to put in ones Head, which has another hole at the bottom going down thro' the Pillar to the River, to which if you apply your Ear, you may hear the noiſe of the Water falling down, even at the time when the Organs (which make a great Noiſe) are playing: There is upon the Right Hand a broad pair of Stairs, with a great Arched Gate, that take down to this Subterraneous River, from which they force Water into a Marble Ciſtern that ſtands in the Church-yard, covered with another great Stone, yet open on the ſides, at which the ignorant People take up Water; believing, by the Inſinuation of the Crafty Prieſts, that 'tis by the Gift of St.* Sorin *an Excellent* Collyrium *for ſore Eyes: This Water as they force into the*

Ciſtern by the Pipes laid under ground on the Waxing of the Moon, ſo they let it gradually out by other Pipes on the Wane of the Moon; which makes the People think that it depends on the Courſe of the Moon. Populus vult decipi.

Let us hear *Seneca*, ſpeaking to the purpoſe; *There are alſo under the Earth leſs known Laws of Nature, but as ſure; believe the ſame to be below, that is above: There are alſo great Caves, there are great Vaults and wide Places formed by the Mountains hanging over them.* Then although we muſt confeſs, that in ſome places Rivers of great bigneſs flow under the Earth, we muſt not therefore believe that in this great Plain on this ſide the *Po*, there is ſo great a ſubterraneous Cavity, and that Fields of ſo great a largeneſs could ſtand without Ruine for ſo long time. I muſt add moreover, that the Depth of this River, in reſpect to its Breadth, ought not to be ſmall, becauſe Nature builds all her Caves and Subterraneous Paſſages Archwiſe; which all muſt have a Depth proportionable to the Breadth, otherwiſe they loſe their Force; and commonly they are of a Circular Figure, or coming near to it, *i.e.* As deep as they are broad, which in this caſe muſt be at leaſt 4 Mile. But this Cavity is of no Depth almoſt, yea, but a few Feet, *viz.* As much as the Auger has made in boring: For paſſing an Iron Rod throw the Hole, the bottom is preſently found, as I have often try'd with others that have been with me.

Moreover, ſeeing the Diggers in the very Terebration, often fall on Stocks of Trees, as my ſelf have often obſerved; we muſt confeſs therefore, that theſe Trees have been before in open Air : And ſeeing in the bottoms of theſe Wells are often found Bones, Coals, and Pieces of Iron, we are likewiſe forc'd to believe, that People have formerly liv'd on that Ground ; or we muſt think, that this great River at that time had a Cover of 6 or 8 Foot, and that this our Plain did afterwards grow higher, by the daily Deſcent of Waters from the *Apennine*, and the paring off of the upper Ground. But the above-mention'd Difficulties do ſtill occur.

But let us ſuppoſe this great River runs this way, and that hitherto he has ſuffer'd a Bridge ; from whence, I pray, comes ſo great a plenty of Water to fill this great Cavity, which we muſt always ſuppoſe to be full, to make the Water riſe up in the Wells? Seeing to ſuſtain the Royal Dignity of the *Po*, ſcarcely ſo many Rivers running into it from the *Apennine* and the *Alps* are ſufficient? And on the other hand, we may affirm that the *Po* comes far ſhort of this Subterraneous River. Laſtly, If this River muſt be 4 Miles broad, I do not ſee why in all the Extent of this Source, the Depth of the Wells is always found the ſame; for the Wells which are digg'd near the ſides of this great Arch, would be deeper than thoſe elſewhere: But there is almoſt no difference in the Depth of theſe Wells. We cannot therefore give way to the Vulgar Opinion of this Subterraneous River, notwithſtanding the Conjectures mentioned, which we ſhall ſhortly Anſwer. And far leſs muſt we believe, that there are many Subterraneous Streams flowing from the ſame Ciſtern, and diſtinguiſh'd by Intervals, which give Water continually to theſe Fountains. For how can it be, ſeeing there are ſo many thouſands of Fountains, and continually ſuch Wells are made both in the City and Suburbs, that the Undertakers never fell upon ſuch Interſtices in the boring? As I have often told, and which one can never admire enough, there is no need of any Caution here; no need of Diligence in chooſing a place, ſeeing any place markt out either in the City or without, for many Miles, is fit for the Building of theſe Wells; and all the Difficulty in digging theſe Wells, is in keeping out the Side-waters, which ſometimes flow in in great quantity, ſo that they need a Wall of Bricks to keep it out: But when the VVorkmen have come to this laſt Bottom, then as having got their wiſh, they begin their Perforation with as great Aſſurance of getting VVater by their Auger, as if they had *Moſes* his

Rod. Neither is the Opinion of ſome to be entertain'd, who think that the ſubterraneous Spaces from which theſe VVaters flow, were formerly the Channels of *Scultenna* and *Gabellus*, between which two Rivers *Modena* is now plac'd; which Rivers, as they imagine, after they had deſcended from the *Apennine*, did join their Waters in this place; and therefore, through length of Time, the Mountains decreaſing and the Fields riſing, the Water riſes to this height in theſe Wells when they are digg'd; or in a hole made with Sand wet with Water, which is ſupply'd from theſe Rivers by hidden Paſſages: And the Sand it ſelf, that they may give Credit to ſo plauſible a Thought, they give an Example; for they ſay, That near a Stream, a Hole being made in the Sand, tho' dry on the Surface, the VVater appears; which alſo by the Obſervation of *Pliny* the younger, is known to be done in the Sea-ſhore. For after this Author, with his accuſtomed Elegancy in a Letter to *Plin. Gallus*, deſcribed the Pleaſantneſs of this Countrey-Village by the Sea-ſide, in the end of his Epiſtle he makes this Relation, as worthy to be taken notice of: *It has Wells, or rather Fountains; for the Nature of all that Shore is wonderful; in whatever place you move the Ground, you meet with Water; and that ſo freſh, as not to have the leaſt Saltneſs from the Vicinity of the Sea.* By theſe words the moſt Learned Man ſeems to give ſome Specimen of our Fountains, ſeeing there alſo, in whatever place the Ground is digg'd, there is Moiſture: Yet 'tis gather'd, by the ſame *Pliny*'s words, that the VVaters of theſe VVells did not ſpring up. I believe the ſame will happen in any Sea-Coaſt, except ſome Bed of Clay intervene, for the VVaters do eaſily follow the Sand: Therefore 'tis no wonder, that in any place of *Pliny*'s Countrey-Houſe the VVater appears freſh, being ſtrain'd through the Sand from the neareſt Sea, and ſo depriv'd of its Saltneſs. But 'tis no way probable, that the Caſe is ſo in our Ground: For tho' I do not deny that theſe Rivers did formerly run in deeper Channels, yet that that they give VVater to this Spring, I can no ways be induc'd to believe. For theſe Springs are perpetual, neither do they know any Increaſe or Decreaſe; when yet theſe Rivers, not only in Summer, but alſo ſometimes in VVinter, have their Sands dry, as we have ſeen of late Years, by reaſon of the hot Seaſon; ſeeing all the VVells except theſe, tho' digg'd deep, gave no VVater in the Neighbouring Countreys, to the great loſs both of Men and Cattel. But the flowing of a moſt pure VVater from theſe Fountains is ſo uniform and conſtant, that 'tis improbable they ſhould depend on the unconſtant and unequal ſtate and courſe of theſe Rivers; for the VVater decreaſing in the deeper Veins, the Preſſure would alſo decreaſe, and ſo theſe Fountains would be diminiſhed. Moreover, ſeeing the Countrey of *Rhegium*, *Parma*, and all on this ſide the *Po*, is plac'd in the ſame Plain; and many Rivers deſcending from the *Apennine*, glide over theſe Countries. I do not ſee, why they do not enjoy the ſame Prerogative when VVells are digg'd deep in them. But no where that I know of are ſuch Fountains obſerv'd, ſo everlaſting, and ſubject to no Alteration. Therefore we may lawfully judge the Ciſtern that furniſhes VVater at the ſame rate to this Source, to be perpetual, never failing, and not temporary.

CHAP. IV.

Of the Ancient State and Form of the Countrey on this, and the other ſide of the River Po.

THerefore having diſcuſs'd the Opinions which take moſt among our Countrymen, of the Nature of this hidden Source, it may be thought fit that I ſhould now tell my own: But before I do that, I think it worth while to enquire, and as far as Conjecture will allow to diſcover, what was in thoſe times the outward Face of this Countrey which we inhabit; ſeeing by the digging of theſe VVells in the Land of *Modena*, 'tis known enough, that the Situation of this Countrey, which is called

Gallia Ciſpadana, and *Tranſpadana*, was very low and depreſt in old times, in compariſon of what 'tis now. *Plato*, when he brings in *Critias* ſpeaking, writes, that there are two things which bring great and ſudden Changes in the Earth, and totally aboliſh the Monuments of the moſt ancient Countreys. The VVorld felt the firſt Calamity in the Univerſal Deluge, the other being reſerved againſt the Day of Judgment, and the Deſtruction of wicked Men, as *Peter* ſays, when a *New Heaven*, and a *New Earth* ſhall appear. *Ep. 2.* 'Tis moſt certain, that the Face of the whole Earth was moſt notably changed, in that Univerſal Drowning and Overturning of all things. But ſome think that ſuch a Change follow'd, that the ſtate of the VVorld before the Flood was quite different from what 'twas afterwards, which yet

I cannot aſſent to. There is lately come from *England* a Book, whoſe Title is, *The Sacred Theory of the Earth*, by *Thomas Burnet.* This Learned Man endeavours to demonſtrate, that the Earth before the Deluge in its firſt Original, had another Form than now it appears to have; ſo that there were neither Seas nor Iſles, nor Mountains nor Valleys, nor Rivers any where, but the whole Body of the VVaters lodg'd in the Caverns of the Earth. Now he feign'd ſuch a Face of the Earth, to the end that it may be perceiv'd without the Creation of new VVaters, from what Store-houſe a quantity of VVater may be drawn ſufficient to cover the Face of the Earth, tho' it had Mountains, which we muſt imagine to have been higher by far than the preſent ones: So that, according to his Reaſoning, neither Rains, how great ſoever, nor *Theom Rabbah* of *Moſes*, *viz.* Abyſs of VVaters hid in the Caverns of the Earth, could be ſufficient for that Univerſal Deluge. But he thinks that the Mountains, Valleys, Seas, Iſles and Rocks, might have appeared in that great cleaving of the whole Body of the Earth, pieces of it being broke off here and there, and ſwallow'd up in the great Gulph; while thoſe, which ſtood in their former ſtate, made a ſhew of Iſles, Mountains, and Rocks; but theſe which were wholly covered by the VVaters, had the Name of Sea and Lakes; and ſo the Earth appeared after the Deluge all broken, torn, and of a quite different Aſpect.

This Fancy, however it may be taken for new, yet certainly is not the Fiction of our Times, but more ancient by far. *Franciſcus Patritius*, a Man famous enough for Learning, in a certain Book of his, *Of the Rhetorick of the Ancients*, written in *Italian*, and Printed at *Venice* by *Franciſcus Senenſis*, *Anno* 1562. The firſt Dialogue has a pleaſant Story, which he ſays *Julius Strozza* had from Count *Balthazzar Caſtillon*, and he had from a certain *Abyſſine* Philoſopher in *Spain*. This wiſe *Abyſſinian* did ſay, That in the moſt ancient Annals of *Æthiopia*, there is a Hiſtory of the Deſtruction of Mankind, and the breaking of the Earth: That in the beginning of the World the Earth was far bigger than now 'tis, and nearer to Heaven, perfectly round, without Mountains and Valleys, yet all Cavernous within like a Spunge, and that Men dwelling in it, and enjoying a moſt pure *Æther*, did lead a pleaſant Life; and that the Earth brought forth excellent Corn and Fruits without Labour. But when, after a long Flux of Ages, Men were puft up with Pride, and ſo fell from their firſt Goodneſs, the Gods in Anger did ſhake the Earth, ſo that a great part of it fell within its own Caverns; and by this means the Water, that before was ſhut up in dark Holes, was violently ſqueez'd out, and ſo Fountains, Lakes, Rivers, and the Sea it ſelf, took its Original: But that Portion of the Earth, which did not fall into theſe Caverns, but ſtood higher than the reſt, made the Mountains: That the Iſles and Rocks in the midſt of the Sea, are nothing but Segments of the Earth remaining after the ſudden fall of its Maſs. I am willing, for the ſatisfaction of the Curious, to give the Author's own words, as more tending to our purpoſe.

'In the firſt Ages, ſaid the Re-'verend Old Man, after the laſt 'Renovation of the VVorld, the

‘ Earth we dwell on was not of that Form, nor ſo little as ’tis at preſent, but far greater, and of a perfect roundneſs; becauſe then it did take up as much place, as it now takes up with the whole VVater and Air together: So that between it and Heaven there was not any thing interpos’d, but a moſt pure Fire, which is called *Æther*, being of a moſt pure and vital Heat. The Earth then was of ſo large an Extent, and ſo near to Heaven. But within, and in the Surface, ’twas very Cavernous, within which were ſcattered the Elements of Air and VVater; and towards the Center was ſcattered a Fire, to warm the places remoteſt from Heaven, and therefore obſcure and cold. Becauſe the other Caverns nearer the Surface of the Earth were illuminated from Heaven by the Openings above, and by its

'VVarmth filled with Life; and 'all theſe Caverns were inhabited 'by Men, and other Animals, for 'the uſe of which the VVater 'and Air were ſcattered over the 'Caverns. The Earth then was 'like a Spunge, and Men dwelt 'within it; their Life was very 'happy, and without any Evil, be'cauſe there was not among Men 'either War or Sedition. Nor did 'they live inclos'd in Cities, as they 'do now, for fear of wild Beaſts and 'other Men; but they liv'd pro'miſcuouſly, and the Earth pro'duc'd its Fruits for their Neceſſi'ty, without any Labour of theirs. 'Further, the Mildneſs of the Air 'and *Æther* were ſo great, that 'the Seaſons did not vary as they 'do now: And knowing then the 'Truth and the Vertues of all 'things, they found they were 'good; they knew alſo the Ver'tues of the Stars, their Senſes be-

‘ing nouriſhed in a moſt pure *Æther*, from whence they had the ‘Knowledge of things Celeſtial ‘and Elemental. ’Tis come to our ‘Knowledge, that in the moſt ancient Annals of *Æthiopia*, among ‘many others, were found *Ægypt*, ‘*Æthiopia*, *Perſia*, *Aſſyria*, and ‘*Thracia*. Now hearken, O Count, ‘ſays the *Æthiopian*, attentively, ‘what occaſioned the Fall of the ‘Earth, and the Ruine of Mankind. The Men of *Aſſyria* knowing all things, and by means of ‘their VViſdom doing VVonders, were well pleaſed with it; ‘from this Self conceit grew in ‘them a great Love of themſelves; ‘by which the Flower of their ‘VViſdom being darkned by degrees, they waxed proud, and began to think themſelves Gods, ‘and to compare themſelves to ‘*Saturn*, that then had the Government of the VVorld; who,

‘as

‘ as he is ſlow to Anger, and ripe ‘ in Counſel, was not at all moved ‘ at the firſt: But when their Pride ‘ increas’d, he in Anger depriv’d ‘ them of the Influxes of his Mind; ‘ from which Privation there ‘ grew in them Ignorance, from ‘ which flow Pride and Inſolence; ‘ and they began to ſeek how to ‘ get up into Heaven, and dethrone ‘ him: which when *Saturn* ſaw, ‘ being in his great VViſdom unwilling to defile his Hands with ‘ Humane Blood, of himſelf reſigned the Government, and gave ‘ it into the Hand of *Jupiter* his ‘ Son; who, after he had taken ‘ on him the Government of the ‘ VVorld, being born to Action, ‘ made a League with his Brother ‘ *Pluto*, who Reign’d in the Roots ‘ of the VVorld toward the Center: The one began to ſhake it ‘ terribly below, and the other to ‘ thunder upon it from above, with

‘ which terrible ſhaking and thun-
‘ dering, the Earth open’d in ma-
‘ ny places, and broke, ſo that it
‘ fell into its own Caverns, which
‘ by that were raiſed and filled up.
‘ From whence it came to paſs,
‘ that it both became leſs, and in-
‘ finitely further off from Heaven,
‘ and was buryed in its ſelf, with
‘ all the things contained in it.
‘ And the Elements which ſtood
‘ higheſt, were, by its weight and
‘ reſtriction, ſqueez’d out, the
‘ lighter and purer did fly higher,
‘ and drew nigher to Heaven;
‘ but of them which were ſhut up
‘ in the Ruins, and were before
‘ lodg’d in the Caverns, part re-
‘ main’d below, and part chang’d
‘ their place. ‘ And it came to paſs,
‘ that where the great Bulk of
‘ Earth fell, and could not be
‘ ſwallowed up of the Caverns, it
‘ remained on high, and afterwards
‘ being preſt hard together by its

‘ own

'own weight, and condens'd by 'the Cold, becauſe of its diſtance 'from Heaven, became Mountains 'and Rocks; and where in the fall 'great pieces of thick Earth were 'ſwallowed up, the VVaters were 'by this diſcovered, from whence 'came Seas and Lakes, Rivers and 'Fountains, great and little Iſles, 'and Rocks ſcattered up and down 'the wide Sea. The Gold, the 'Silver, and other Metals, which 'in the beginning had been moſt 'fair and precious Trees, were co'vered in the Ruins. But there 'are ſome Remains of the Seeds 'ſhak'd off at that time, which 'now are digg'd with ſo great La'bour, being neither ſo pure, nor 'of great Vertue, as formerly: 'And the Diamonds, Carbuncles, 'Rubies, Emeralds and Chryſo'liths, Saphires, Topazes, and o'ther Jewels, which be now found, 'are the thickning of the Rocks of ‘the firſt Age; and they are, in ‘memory of theſe firſt times, to ‘this day had in great Eſteem, ‘admir’d and reverenced as the ‘moſt ancient things. The Porphyres, the Alabaſters, Serpentines, and other fair Marbles of ‘different Colours, are no other ‘than ſome Particles of the Virgin Earth, which was neareſt to ‘Heaven, and in the Fall were ‘thickned, and united, either by ‘their own Weight, or ſome other, or by Cold: From whence ‘’tis, that by the Searchers after ‘Metals and Marble, there have ‘been found many both Sea and ‘Land Animals, turn’d into Stone ‘and Volatils; yea, many times ‘Mens Bodies that have been all ‘taken hence, inclos’d in their firſt ‘ſhape in moſt ſolid Stone, without any opening. And from hence ‘’tis, that there are ſeen ſo many ‘thouſands of Fiſhes, Oyſters, and

‘Cockles congealed, and Figures ‘of divers Animals; which ſome, ‘through ignorance of things paſt ‘admir’d ſo much. Theſe terrible things did at that time happen on the Earth; but the Animals and Men that were found ‘Dwellers in the Caves, remain’d ‘all bury’d by the Earth falling on ‘them; and an infinite number ‘of thoſe who dwelt in the outer ‘parts, by the terrible ſhaking beneath, and the frightful Noiſe ‘above, died of Fear; and among ‘the others, all the *Aſſyrians*. In ‘the other Countries few remained alive, and theſe alſo continued, either by the Fall, or thro’ ‘Fear, many Days in a Tranſe, ‘and without Pulſe. But after ‘they were recover’d, they continued aſtoniſht and full of great ‘Fear, that ſhortned their own ‘Life, which at the firſt was very long, and their Childrens.

‘There was alſo among Men a ‘Stupidity, which made them ignorant of all things, and was the ‘Effect of the firſt Aſtoniſhment ‘after the Fall of their firſt Fathers; and yet if they ſeem’d to ‘know any thing, they ſaw it ‘through a thick Cloud. Moreover, ſince the Fall, if a Man had ‘the Truth revealed to him by ‘chance, Fear made him keep it ‘ſecret; for in all remain’d a Memory, the Knowledge of Truth ‘being the occaſion of their Parents Pride, and that of their Ruine. For if any had the Boldneſs ‘to diſcover it, he darkned it a ‘thouſand ways, for fear of being ‘reproved, and ſeverely puniſht ‘by another. For this Reaſon the ‘Sciences have been taught in ‘dark Sayings, in Fables, in Figures and Numbers, in Sacred ‘Rites, and in a thouſand other ‘hidden ways. And from thence

‘ ’tis belike, that Princes and o‑
‘ thers, who would be powerful
‘ in the Earth, have choſen to fol-
‘ low the Opinion of the common
‘ People, and have perſecuted with
‘ all Rigour thoſe that would tell
‘ the Truth. Fear therefore ha-
‘ ving poſſeſſed all Men, by which
‘ they were diſperſt, ſuch as re-
‘ main’d began to join themſelves
‘ together, and to beget Children,
‘ to help them and defend them;
‘ they encompaſt themſelves with
‘ Fences and Ditches, in which time
‘ they reverenc’d and perform’d O-
‘ bedience to the Aged. After this
‘ as the number of their Poſterity
‘ increas’d, and the Ties of Affini-
‘ ty decreas’d, they divided their
‘ Goods that were hitherto com-
‘ mon, and ſo parted Friendſhip.
‘ After which all things went in-
‘ to Confuſion, every one robbing,
‘ cheating, and killing another, and
‘ inventing new Tricks to defraud

'his Neighbour. From this, as 'Boldneſs grew in thoſe that were 'of fiercer Spirits, and more inge'nious to hurt, others became 'more fearful; which Fear ſharp'ned their Wit, ſo that conſulting 'together, they found out the 'Name of Peace and Juſtice. Af'terward they contrived a long 'Chain of Words, with which 'tying Juſtice and Peace by the 'Feet, by the Arms, by the Mid'dle, and by the Neck, in a thou'ſand ways, they thought to keep 'her, that ſhe ſhould not depart 'from their State, committing the 'keeping of theſe Chains, which 'they call'd *Laws*, into the Hands 'of wary Men, and of their own 'Temper, which they called Judges 'and Magiſtrates.

'By theſe Artifices did the ti'morous ſecure their Lives and 'Goods from the Injuries of the 'more powerful; till at length

‘ one that was bolder than the reſt, ‘ aſſociating himſelf with the fear- ‘ ful and weak, became their Pa- ‘ tron. Theſe alſo were thruſt ‘ from their place. After this rate ‘ have the Societies of Men been ‘ managed hitherto, and ſo they ‘ are at preſent, and will be for ‘ the time to come. When the ti- ‘ morous join’d themſelves toge- ‘ ther, there aroſe Counſellors; ‘ and when they were called into ‘ Judgment, there aroſe Judges. ‘ This now, Noble Sir, is the great ‘ Hiſtory which the wiſe *Abyſſinian* ‘ told the Count, worthy to be ‘ had in great Veneration, and ‘ highly to be eſteem’d.

Helmont ſeems to have entertain’d an Opinion about the Face of the Earth before the Deluge, not unlike to this; his Words are theſe: *From whence I conceive the Earth to have been in one piece, and undivided;*

undivided; foraſmuch as 'twas be-water'd with one Fountain; and laſtly, to have had no Iſles, but the whole Globe was Sea on one ſide, and Earth on the other. This was the Face of the World before the Deluge, after which the Earth did open into ſeveral ſhapes, and out of the Abyſs of theſe Chinks did the Waters break out.

But let us leave the Opinion, no leſs diſagreeing with the Interpretation of the Sacred Scriptures, than with Nature it ſelf. *Scaliger* ſpeaking of the Aſſerters of that Opinion, about the Generation of the Mountains, ſays, *That they piouſly dote, who have told, that the Earth was pulled out of, and ſav'd from the Deluge.* Yet 'tis certain, that the Earth in that Univerſal Deluge did not ſuffer an ordinary Change, ſo that the Fortune of things being changed, *Thetis* and

Veſta chang'd their places; from whence *Ovid* ſays,

Quodque fuit campus, vallem decurſus aquarum
Fecit, & eluvie mons eſt deductus in æquor,
E que paludoſa ſiccis humus aret arenis.

In Engliſh thus:

Torrents have made a Valley of a Plain,
High Hills by Deluges born to the Main;
Steep ſtanding Lakes ſuckt dry by thirſty Sand,
And on late thirſty Earth now Lakes do ſtand.

I believe it has not happened otherwiſe to this Countrey of ours: For I conceive, that in the firſt beginning of the World, all this Plain, than which *Italy* has not a greater, and which the *Po* does now divide into *Gallia Ciſpadana*, and *Tranſpadana*, was once a Sea, and a part of the *Adriatick*. So in the Univerſal Deluge, the Mountains being par'd off, and bar'd, ſo that they lookt like Bodies extenuated by a Diſeaſe, as *Plato* wrote of the *Atlantick* Iſland; we have reaſon to think that this Bay of the Sea was filled with Sand, and ſo became a Valley; and afterwards, in proceſs of time, by continual Deſcent of Waters from the *Apennine*, and the *Alps*, and other particular Deluges, (ſuch as was that which happen'd *Anno* 590. in *Gallia Ciſalpina*, than which 'tis thought there has not been a greater ſince the Days of *Noah*, as *Patavinus* ſays in his Fifth Book of the Antiquities of *Verona*) this Ground did grow up by degrees, and by many Lays or Beds, to the height we do now ſee it of. Both

Ancient and Modern Writers judge the ſame of the moſt famous and greateſt Plains in the Earth, as in *Egypt*, &c. which *Ariſtottle* ſays formerly was a part of the Sea; and *Herodot* calls it, the Gift of the *Nile* (ſeeing the Etymology of *Nile* is derived from *Limus*, Slime) which he likewiſe ſays of the Countreys about *Ilium*, *Teuthrania*, and *Epheſus*, to wit, that they were ſometime a part of the Sea: Yea, the ſame *Herodot* hath left it in Writing, that if the *Nile* turn'd its Courſe into the *Arabick* Gulph, it would at length cover it all with Slime. Lib. 4. *Polybius* ſays, that the Lake *Mæotis* and the *Euxine* Sea are conſtantly fill'd with plenty of Sand, which great Rivers do continually bring into it, and that the time would be when they ſhould be made even with the Continent; taking an Argument from the Taſte of the

Water, *viz.* That as *Maotis* is ſweeter than the *Pontick*, ſo the *Pontick* is ſweeter than the *Euxine*. Modern Writers think no leſs of the great and plain Countreys, among whom is the moſt Learned *Kircher*, who in his *Mundus Subterraneus*, ſays, from the *Arabick* Antiquities, and other Obſervations, That the great Plain, which lies between the *Arabick* and *Perſian* Gulph, before the common Deluge, was covered with Sea-waters. And he alſo thinks, That the Sandy Deſarts of *Tartary* were formerly the place of Waters, and all one with the *Caſpian* Sea, and afterwards in length of time to have been rais'd to a greater height, and turned into great Fields. Neither need we to go ſo far off for Examples. We underſtand by Hiſtory, that *Ravenna*, as well as *Venice*, was plac'd in the Sea; but ſeeing now 'tis 5 Miles from the

Sea, no body knows how much Land has accrew'd to it by the retiring of the Sea; a Prodigy truly worthy of Wonder, that where Ships did ſail before, now there are Groves of Pine-trees. Upon the ſame account may we call the Land of *Ferrara*, the Gift of *Eridanus*, by reaſon of the ſlimy Water which this Royal River did by many Mouths diſcharge into the *Adriatick* for ſome Ages; by which it came to paſs, that a Colony of Fiſhes was by a true Metamorphoſis chang'd into an Habitation of Men; for which *Ovid* ſays,

——Vidi factas ex æquore terras,
Et procul à pelago conchæ jacuere marinæ.

I've ſeen the Seas oft turned to a Plain,
And Lands were tilled where was before the Main.

Tho' I dare not abſolutely ſay, that all the Countrey which lies between the *Apennine* and the *Alps*, was a Sea formerly; yet by what is obſerv'd in the digging of the Wells, Oyſter-ſhells, and other Sea Products being found in their greateſt Depth, it may be not without Ground conjectured, that the *Adriatick* did at leaſt come thus far, or that the Bays communicating with the Sea, did ſtagnate here.

Yet 'tis without doubt from the Writings of the Ancients, that between the *Æmilian* Way (in the middle of which is ſeated *Modena*) and the *Po*, there was a Lake reaching from the *Adriatick* even to *Placentia*, which, from the Neighbourhood of the *Po*, they called *Paduſa*, into which many Rivers deſcending from the *Apennine*, diſcharg'd a great quantity of

Waters. *Virgil* makes mention of this Lake in theſe Verſes:

——Piſcoſove amne paduſæ
Dant ſonitum rauci per ſtagna loquacia cygni.

Or murmuring Swans that ſound their fanning Wings
Paduſa's *Fiſhy Banks upon, or Ecchoing Springs.*

But *John Baptiſta Aleottus*, in his moſt Learned Book againſt *Cæſar Mengolus* of *Ravenna*, ſhews, by ſtrong Reaſons and Authorities, that no River from *Splacentia* to the Coaſt of the *Adriatick* Sea, did come into the Channel of the *Po*, but that they all diſcharged themſelves into this *Paduſa*, for which he brings the Authority of *Strabo*, who writes, That this Lake was a great Hindrance to *Hannibal*, when he would have paſs'd his Army into *Etruria*; which Lake being not long after, by the Diligence of *M. Scaurus* the Surveyor, dried up, was turned into moſt fruitful Fields, many Rivers being brought within their own Banks to enter into the *Po*, as *Tarus*, *Parma*, *Entia Gabellus*, *Scultenna*, the *Rheine*, and other Rivers of no ſmall Note. Upon this account we may reaſonably think, that the *Po* was not ſo famous of old, nor had the Name of *Royal*, till by the Acceſſion of ſo many Rivers he had enlarg'd his Power. And therefore *Herodot*, a moſt ancient Writer, deny'd that there was any River found, called *Eridanus*; which was no ſmall matter of admiration to *Pliny*, that when *Herodot* wrote his Hiſtory at *Thurium* in *Italy*, he knew no River by the Name of *Eridanus*. But ſeeing *Herodot*, as *Pliny* relates, made his Hiſtory 310 Years after the founding of *Rome*, we may thence conjecture, That the *Po* did at that time run with leſs Glory, and in a ſtraiter Channel; or that the Hiſtorian ſpoke of another River.

There is diſtinct enough mention made of this Lake in the forecited *Johan. de Argenta*, and eſpecially in *Leander Albertus* in his Deſcription of *Italy*, who meaſures the Length of this Lake from *Lamon* by *Ravenna*, even to *Scultenna*, and tells all the Rivers which within this ſpace deſcended from the Mountains into this Lake, and there ended their Courſe; and that *Hercules*, the firſt Duke of *Ferrara*, ſuffered the *Bononians* to bring the *Rheine* within his Banks, that ſo he might enter into the *Po*; by which it came to paſs, that many Valleys of *Ferrara*, and alſo *Bononia*, were turned into moſt fruitful Lands. But when afterward the *Rheine* had broke over his Banks in the time of *Hercules* the Second, when the Fields were again turn'd into Water, and many Contentions aroſe among the *Bononians* and *Ferrarians*; at length the ſame Prince granted, that the *Rheine* might be again brought into the *Po*.

Therefore we muſt obſerve, that the Situation of this Countrey, in which *Modena* is now plac'd, was very low, ſeeing this Countrey border'd upon *Paduſa*, into which ſo many Rivers did run; of the lowneſs of which Ruſhes, Coals, Bones, Stocks of Trees, found in the Depths of 63 Feet, are moſt ſure Proofs; all which make it evident, that this Ground was ſometime expoſed to the Air, and that it had no other Aſpect than now the Valleys of *Como* have.

Therefore 'tis not without cauſe, that *Cluverius*, in his Deſcription

of

of *Italy*, thinks a certain place of *Pliny* deſerves amendment. For *Pliny*, when he had deſcribed certain Iſlands floating in ſeveral places, like the *Cyclades*, as in the *Cæcuban* Lands, the *Reatine*, the Lake of *Vadimon*, writes, that the ſame is obſerv'd in the Land of *Modena*. But *Cluverius* for *Matienſis* plac'd *Mutinenſis*; foraſmuch as one may ſee ſuch floating Iſlands made of Slime and Reeds in the Valleys of *Como*. Yet 'tis out of all queſtion, that the Situation of this Town, together with the adjacent Lands, in the ſpace of 1800 Years, has grown 14 Foot; for in this Depth Cauſways of Flint, and Shops of Artificers are found by digging, which certainly then was the Plain of the Town, when the Colony of the *Romans* was brought hither: Further, when I was writing this, there was found a Piece of *Adrian* the Emperours Coin, of

Corinthian Braſs, in the Depth of 18 Feet.

Hiſtory teſtifies, that *Mantua* at that time was not far from the Marſhes; for *Appianus Alexandrinus* tells us, that *Marcus Antonius* and *Panſa*, in the Siege of *Mutina*, did fight amongſt the Fenns, and in Grounds overgrown with Reeds; and afterwards near *Mutina*, in a little Iſle of the River *Labinius*, when at that time the Land of *Modena* was extended ſo far) the *Triumviri* met, and eſtabliſht that horrible Baniſhment of their Countrymen; when yet in this our Age there are no Veſtigies either of Fenns or Iſlands, only moſt pleaſant Fields are to be ſeen. So that with the Prince of Poets we may cry out,

Tantum ævi longinqua valet mutare
vetuſtas.

Such wondrous Changes great length
of time does bring.

Yet this growing up of the Ground, which is obſerv'd by the great Depth of theſe Wells, (I do not ſpeak of the deeper parts, whether Humane Induſtry cannot reach) was but ſlowly made, and by Slices, as it were, through length of time, as the ſeveral Lays of Earth do witneſs, which are obſerved in all Wells conſtantly in an equal Order and Diſtances when they are digged; ſo that this growing up of the Ground ſo well diſtinguiſh'd, and ſo remarkable in the digging of all Wells, ought to be thought rather the Product of ſo many Ages, than the tumultuary and confus'd Work of the common Deluge.

This doubtleſs then was the Face of the Countrey on this and the other

ther ſide of the *Po*, which being formerly covered with Waters, and not habitable, now is remarkable for its Largeneſs, and the Fertility of its Fields, and has in it many Towns and Cities: For if we turn over old Authors, we ſhall find no mention made of Towns or Cities below *Brixillus* and *Cremona*, near the *Po*, even to the *Adriatick*; but as many as were, and yet are in the Region on this ſide the *Po*, were built either near the Roots of the *Apennine*, or not far from them, as *Bononia*, *Modena*, *Regium*, *Parma*, &c. But we may infer, both from what was ſaid before, and alſo from the little that this Sandy Bed, through which theſe Subterraneous Waters do run, wants of being in the ſame Level with the Sea, that the Sea did cover this Countrey in the beginning of the World. For if, according to the Obſervation of *Aleottus de Ar-*

genta, a moſt diligent Hydrographer, whom we before cited, the *Rheine*, from the Foot of the Hills near *Bononia* to the *Po*, into which it does now no more run, has a Declivity of 123 Feet, 7 Inches; and the *Po* from thence to the Sea has a Deſcent of 15 Foot 7 Inches; and therefore the whole Declivity of the *Rheine*, and perpendicular Height to the Sea-ſhore, will be 139 Foot, omitting the ſmaller meaſures, the Plain out of which theſe Fountains ſpring, and that *Mutina* ſtands on (which is diſtant about 10 Mile from the Roots of the Mountains) will differ no more than 20 or 40 Foot from the Level of the Sea, as one may conjecture, ſeeing I have not leiſure to examine theſe matters exactly, nor is it any great matter: But if we might dig further down, other Beds would doubtleſs appear, till we meet at laſt with the Plain, which was formerly the bottom of the Sea. But 'tis better to ſearch into other things, and to get out of theſe profound Abyſſes, if we can go no further.

CHAP. V.

What is the Nature and Condition of this hidden Spring.

AS in the Works of Art, 'tis not ſo ſafe from the Similitude of Effects which fall under our Eye, nor without fear of a Miſtake, to infer the ſame Artifice of Mechanical Parts; as may be ſeen by the Example of two VVatches, which tho' they have the ſame outward Form, and exactly perform the ſame Operations as to time, yet may have the inward Structure quite different; ſo 'tis leſs ſafe to make the ſame Judgments of the curious VVorks of Nature, and to determine what Inſtruments it uſes, and what is its ways of working: VVherefore 'tis much, as *Ariſtotle* ſays, if things obſcure and hid to our Senſes be explained by Poſſibilities. Seeing I am come ſo far, that I muſt at length tell what I think of the Nature of this admirable Spring, I believe I have done the part of a good-Gueſſer, if by ſounding this Ford, I can tell things probable and agreeable to the Laws of Nature, inſtead of things certain.

VVe may therefore conjecture, that the Sea in this our Countrey had ſecret Commerce with the *Appennine*, to which it was adjacent in the beginning of the World, and that it ſtill has; and that it laid a Foundation by ſeveral ſubterraneous Paſſages in its Bowels for ſeveral Storehouſes of Waters, of which this may be believed to be one, from whence theſe Fountains derive their Original, and that the Water is expanded over all this Vein of Sand, in which ſuch a

Spring is diſcovered : But when the Stop is taken away, and the Flood-gates are opened, it riſes on high as in Aqueducts. And this Thought of mine, as it does not contradict Nature, ſo it ſhuns thoſe Difficulties, which the foremention'd Opinion of an Immenſe Space, through which a ſubterraneous River flows, does incur. That a great abundance of VVaters may ſecretly flow a long way, through Sand, is neither againſt Reaſon nor Experience, ſeeing 'tis the Property of Sand eaſily to drink up VVater, and therefore has the Name of Sinking Sand.

Lib. 5. *Hiſt. Nat.* c. 9. & c. 35. *Pliny* and *Solinus* ſay, that the *Nile*, the greateſt of Rivers, being ſwallowed up in the Sands, runs hid a great way, tho' nothing of that is known in our Times. *Lib.* 3. *Quæſt. Nat.* c. 28. *Seneca* alſo teſtifies, that ſome Rivers

vers fall into Caves, ſome are by degrees conſumed, and never appear again. The moſt Learned *Kircher* ſays, that in *Weſtphalia*, near the Village *Altembechem*, there is a certain ſandy Plain, in which every Day the Water breaks out with great Violence, ſo as to overflow the whole Countrey, and afterwards ſinking into the Sand, diſappears, the Surface of the Sand remaining dry. The River *Guadiana* in *Spain*, as ſome relate who have obſerv'd it, when it has come to a certain Plain, is gradually ſwallowed up, and without noiſe of the Earth; which is a moſt certain Proof, that this River does not fall into a Gulph, but runs away by theſe Beds of Sand. In like manner I do believe, that the VVater deſcends by ſecret Paſſages from a Ciſtern in the Roots of the adjacent Mountains, that communicates with the Sea, till it come into this deep ſandy Plain, mixt with much Gravel ; ſo that there is no need to conceive any Plain of great width and depth, by which theſe ſubterraneous waters may conſtantly run down, but a few interſperſt ſpaces may ſuffice, becauſe of the Mixture of Sand and Gravel.

Helmont ſays, that Sand is Original Earth, and the Seat of the VVaters, but that the reſt of the Earth is the Fruit of this Original Earth, and that not without Reaſon, ſeeing the reducing of this Sand into VVater is more difficult than of any other Body. This ſame Author makes this Sand the laſt Bounds of digging, beyond which to proceed were loſt Labour, becauſe of the continual Conflux of Sand and VVater. But he thinks that this Sand is extended from the Shell of the Earth to the Center, and abundance of Water lodges in it ; ſo that the Water which is kept in it is a thouſand times bigger than what is in the whole Ocean. All Seas, Rivers and Fountains, even in the top of the Mountains, owe their Original to this inviſible Ocean, ſo that the Water does every where follow the vital Sand. *Teleſus* ſeems to have been of the ſame Judgment, who ſaid, the bottom of the Sea was a Fountain of that Interiour Ocean, which agrees with that Opinion of *Plato* concerning the Gulph, from whoſe Boſom all Waters go out, and into which they all fall back again.

Whatever be of Truth in this Opinion, of an Inviſible Ocean lurking in the Sand, which *Helmont* conceiv'd ingeniouſly, and upon probable enough Arguments ; yet I think none will deny, but Water may run a long way through Beds of Sand ; and when ſome Paſſage is open, may be rais'd again, eſpecially if it be urg'd by Water deſcending from a higher Ground. And I think that 'tis probable the matter is ſo in our Fountains, to wit, the Water flows out of ſome Ciſtern plac'd in the neighbouring Mountains, by ſubterraneous Paſſages, where the Earth is firm and hard; but when it has come into the Plain, it expatiates far over the Sand, and in the way is lifted up to this height when a Hole is made with an Auger, according to the Laws of Hydroſtaticks.

And I think this is a more expeditious and eaſie way of explicating the Nature of this never-enough-admired Spring, than to imagine a great Vault, (of which there are no Marks) and a Town with a whole Countrey hanging over it.

To give ſome Specimen how this flowing of the Water may be according to my Explication: Suppoſe, as in *Fig.* 2. that there is a Ciſtern in the Bowels of the *Apennine*, drawing Water from the Sea, and that the Water is carry'd by ſubterraneous Pipes from the ſame Ciſtern, and ſpread over this deep and ſandy Plain *A B C*, mixt with much Gravel; which ſandy Plain being brought into much leſſer Bounds, the Water is forc'd to run down by a more narrow ſpace than it had in the beginning, and to follow its Courſe till it come into the Sea, or ſome great Gulph. Therefore Wells *E F G H* being digg'd, without any Choice in all the Tract lying upon this Spring, and a Hole being made by the Auger, the Water of neceſſity muſt be lifted up on high, being forc't by another, which deſcending from a higher Ground, preſſes on that which goes before, and drives it up. By this means theſe Waters

ters receive a plentiful Supply from their Father *Apennine*, as does the Well of Waters which flows from *Lebanon*, of which there is mention in the Sacred Hiſtory. *Cant.* 4.

But 'tis, by far, more probable, that the Water is ſent from the Sea into ſuch a Ciſtern, than from Showers, or melted Snows, ſeeing Rain and Snow-waters run away for the moſt part by Rivers above Ground; neither can they enter into the ground ſo deep; as *Seneca* alſo teſtifies, *L.* 3. *Quæ. Nat. c.* 7. That there is no Rain ſo great, which wets the ground above Ten Foot: For as he ſays, when the Earth is glutted, if any more fall, it ſhuts it out. And truly, how could it come to paſs, that they ſhould flow at the ſame rate as well in moiſt as in dry Seaſons, if the Rain-Water came hither, and they did not rather get their VVaters from the Sea, which being ſtrained through the Sand, and deprived of all Salt, they return to the Sea again with Intereſt. Truly, I could never yet underſtand, how that ſecret Ciſtern, from which VVaters are ſent to theſe Fountains, ſhould not be unconſtant, if they received Moiſture for a time from the Rains and Snows; and ſometimes increaſe, ſometimes decreaſe; and therefore, according to the Increaſe and Decreaſe of the Preſſure, ſome Alteration ſhould appear in theſe Fountains.

But the Beds of Clay, which divide the impure from the moſt pure VVaters, as moſt ſtrong Fences, do hinder the Rain VVaters from being mix'd with theſe ſubterraneous VVaters. And *Plato* thought, that a clayie Ground was the laſt Bounds of digging in the ſearch of

De Leg. Dial. 8.

of VVell-waters, obliging every one to dig to the Chalk; and if there was no VVater found in that Depth, he ſuffer'd as much to be taken from the Neighbours as they had need of, to which *Pliny* ſubſcribes, ſaying, *That when Potters Clay appears, there is no more hopes of getting Water, nor need Men dig longer*; which yet agrees not with what is obſerved here.

As I have deduc'd the Original of this VVater from the Sea, ſo I do not deny, that many Fountains owe their Originals to Rains and melted Snow; yet with this difference, that the Fountains which have their Spring from the Sea by hidden Paſſages continue perpetual, but thoſe which riſe from Showers and temporary Springs at ſome time of the year, are diminiſhed, and quite dry up; as happens in great Droughts; ſuch as *Baccius* mentions to have been *Anno* 1556. in which not only all the Fountains, but alſo great Rivers dried up. The Countrey on this and the other ſide of the *Po* did experience ſuch a Seaſon almoſt for two Years together, *viz.* in 1687. and 88. in which time the Lands were unpleaſant becauſe of the Drought, and VVells were digg'd in other places, but to no purpoſe; yet little alteration was to be obſerved in theſe our Fountains, nor yet in the moiſteſt Seaſon of all; which made the Year 1690. fatal for Dearneſs of Proviſion, and Epidemick Diſeaſes; ſo that theſe our Fountains ſeem to be of the ſame nature with that Fountain in *Tyanus*, conſecrated to *Jupiter*, of which *Philoſtratus* ſays, *That it ſuffer'd neither Increaſe nor Decreaſe*; and therefore by the Natives is called *Unquenchable.* Or like the VVell of *Æſculapius*, which as *Ælius Ariſtides*, a moſt famous

Orator, relates, was a VVell of *Pergamus* a City of *Aſia*, of ſuch a nature, that it was always full to the brim; and how much ſoever was drawn from it, it never decreas'd.

Neither have we Reaſon only to think, that many Fountains take their Original from the Sea, but alſo many Lakes communicate with it. The Lake of the *Vulſinians*, whoſe Depth is not yet found out, for diſcovering of which I have ſeen between *Narthana* and *Biſentina* Ropes let down for ſome Hundreds of Fathoms, but in vain. This Lake, I ſay, both Summer and VVinter, diſcharges it ſelf by the River *Martha* perpetnally into the *Tyrrhenian Sea*, neither does it receive any Rivers, and the Mountains which encompaſs it are never white with Snow. Beſide, in the ſame Lake, when the Air was very calm, and the ſurface of the VVater was ſmooth, I obſerved often inteſtine Motions like Currents in the Ocean, which was known by the Fiſhermens Nets, which being ſunk under Water, were ſnatcht violently from their hands; an evident Proof of ſome hidden Commerce with the Sea. *Julius Obſequens*, in his Book of Prodigies, relates, That the Lake *Albinus*, in the Conſulate of *Valerius* and *M. Valerius*, was ſuddenly raiſed up, when no Rain fell from Heaven, neither could there be known any Cauſe of ſo ſudden a ſwelling. I cannot be ignorant that the Original of Fountains and Rivers from the Sea is called in queſtion. *Gaſpar Bartholinus*, who follows the glorious Footſteps of his Anceſtors, Printed a Treatiſe at *Hafnia*, wherein he endeavours to prove that Opinion to be abſurd, which deduces the Original of Fountains and Rivers from the Sea; ſo that all Fountains, as well temporary as perpetual, according to him, owe their Original to Rain. Suppoſe, as he ingeniouſly endeavours to prove, that for maintaining the Perpetuity of the Fountains in a dry Seaſon, a Collection of the Water of the precedent Rains in ſome Receptacle within the Cavity of the Mountains is ſufficient. But truly, I cannot ſee how in ſome Fountains their Regularity and equal flowing can hold out for ſo long a time, as is obſerv'd in ours for ſo many Ages; ſeeing in whatever Seaſon, either dry or moiſt, there appears no ſign of Increaſe or Decreaſe.

But *Scaliger* anſwers to thoſe things which uſe to be objected againſt the Opinion of the Original of the Fountains and Rivers from the Sea, in oppoſition to *Cardan*, ſaying, There is no reaſon why the Sea-water, before it come to the Mountains, does not break out every where, in theſe words: *But, O* Cardan, *he whom in the 2d of* Geneſis, *the Divine Man ſays to have finiſht all things, was ſo good an Architect, ſo wiſe a Water-Bailif, that* Julius Frontinus *is nothing to him: He therefore did ſo skilfully join the Pipes of his Aqueducts, and fit them for bearing the Burthen, as to free you from this fear.* But truly, this Difficulty which is objected about the ſufficient ſtrength of the ſubterraneous Paſſages, gives no leſs trouble (excepting the greater diſtance) to the Aſſerters of the other Opinion, who attribute the Original of Fountains and Rivers to Rains.

But how Water is furniſht to the Fountains from the Sea, which being heavy of its own nature, muſt flow back into the Sea from whence it came, making as it were a Circle, is not agreed upon among thoſe, who admit the Original of Fountains to be from the Sea, as may be ſeen in *Gaſpar Schottus*, who rehearſes many Opinions of the Ancients and Moderns, and examines them. So true is it what *Ariſtotle* ſays, *That 'twas an old Doubt, why ſeeing ſo great a quantity of Water runs to the Sea, it does not thereupon become bigger.* Some think that the Sea-water aſcends above its own Original by the attractive force of the Earth, ſome by ſhaking and the Sea-tide, ſome by force of the incloſed Spirit, which drives up the Water to the top of the higheſt Mountains; others do attribute it to the Preſſure of the Air, which by perpetually breaking down the Surface, lifts the VVater up on high; ſome recur to the Divine Providence: There are others who ſay, That the Sea-water flows with a natural Motion, whether from the bottom of the

Sea, or the ſides, to the Springs of Fountains plac'd in the moſt high Mountains, becauſe the Sea is higher than the Earth, as the ſame *Schottus* thinks. But I like better the Opinion of *Des Cartes*, of which was alſo our Countreyman *Falloppius*, who thinks that the Sea-water, by reaſon of the ſubterraneous Heat, is raiſed in form of a Vapor to the higheſt Mountains; and there, by reaſon of the ambient Rocks condens'd into Water, as is uſual in Chymical Diſtillations, ſo that the Mountains are like Heads of the Alembicks, by the Cold of which the exalted Vapors are condenſed into Water, which afterwards breaks out into Springs. *Julius Cæſar Recupitus* tells, in his Hiſtory of the burning of *Veſuvius*, that at the ſame time it did ſend forth two Streams, one of Fire towards the ſhoar, another of Water on the other ſide that looks to the Plain of *Nola*, the Fire not only keeping time with the Waters; but alſo producing them: For 'tis to be thought that by force of the violent Heat diffus'd over the Mountains, ſo great a quantity of Waters was exhaled from ſome Ciſtern that held the Sea-water, that it was ſufficient for making a Torrent.

Perhaps it might be as conveniently deduc'd from the Rarefaction of the Air inclos'd within the Bowels of the Mountains; preſſing down the Surface of the Water, and ſo forcing it out another way.

Neither do the Beds of Stone and Chalk, which *Bartholine* objects, withſtand the lifting of the Vapors upward: For ſuppoſing the Mountains are, as all confeſs them to be, cavernous within, ſuch Beds as theſe might afford this uſe, to ſtop the Vapors lifted upward by force of the Heat, and let them fall down by various Chinks as Veins, to which theſe Beds, eſpecially ſuch as are gravelly and ſtony, are paſſable; from whence the Fountains ariſe, which are called Mouths of the Veins. Therefore 'tis a more ready way, and more agreeable to the Laws of Nature, to draw the Original of Fountains, which are perpetual, and ſubject to no Alteration from the Sea, by the continual Aſcent of Vapors in the great Receptacles of Nature. And 'tis reaſonable to think it ſo in our Caſe, both from the old ſtate of the Countrey on this ſide the *Po*, and alſo the perpetual Fires that the Neighbouring Mountains maintain, which at their wide Mouths ſometimes throw up much Fire and Aſhes, with Stones, with ſo great a Noiſe and Craſhing, that it is heard ſometimes 12 Miles off; which truly is not new, ſeeing *Pliny* mentions this, who writes, That in the Land of *Modena* the Fire comes out on ſet Days; and tells it as a Prodigy, that two Mountains met together, Smoke and Fire coming out; and that in the Day-time a great multitude of *Roman* Horſemen and Travellers were looking on. But that is eſpecially ſeen in Mount *Gibbius*, where there are many Fountains, from which *Petroleum* flows.

An Account of ſome very remarkable ones I had from my Brother who ſaw them, and was confirmed to me by Seignior Spoletti, *Phyſician to the late Ambaſſadors from* Venice, *and Profeſſor of Phyſick at* Padoua, *when he was at my Chamber. They be ſeen on a ſide of one of the* Apennine *Mountains, half way betwixt* Bologna *and* Florence, *near a place called* Petra Mala, *about*

Five Miles from Fierenzola; *'tis in a ſpot of Ground of three or four Yards Diameter, which inceſſantly ſends up a Flame riſing very high, with no Noiſe, Smoak, or Smell, but gives a very great Heat, and has been obſerved to be thus in all times, except of great Rains, which put it out for a while; but when that is over, it burns with greater violence than before; the Sand about it when turn'd up ſends forth a Flame, but within 3 or 4 Yards round about it there are Corn Fields. The People that live near to it, believe that there is a deep Hole there; but he found it to be firm Ground. There are 3 or 4 more of thoſe near, but they do not burn ſo vehemently as this.*

When I was thinking on a more exact Hiſtory of theſe Fountains of *Petroleum* than is in Writers, I underſtood by Letters from *Mal-*

liabecchius, (to whom, as Prince of the Learned) whatever happens new in Learning is preſently brought) that the moſt Learned *D. Olinger*, the King's Profeſſor at *Copenhagen*, had lately Publiſhed a Book, which he found among ſome Manuſcripts, under the Name of *Franciſcus Areoſtus*, of the Oil of Mount *Zibinius*, or the *Petroleum* of *Modena*, which Book that moſt Renowned Author Dedicated to the ſame *Malliabecchius*, with a Preface to the Reader: A great Reproach of our ſloth, who ſtay till ſome riſe from the remoteſt Countreys to illuſtrate our Matters by our own Writings.

Though I derive the Original of our Fountains from the Sea firſt, then from ſome Ciſtern of VVater plac'd in our Mountains, into which the Vapors, ſent up by the inclos'd Heat, are returned in form of VVaters. I would not thence infer, that this Ciſtern is plac'd in the tops of the *Apennine* Mountains; But I believe rather that 'tis plac'd in the Foot of the Mountain, than in the top; for though, as I ſhow'd before, 'tis not always neceſſary, that the VVaters, though inclos'd within Pipes, ſhould reach to the height of their Ciſtern, which happens as often as their Paſſage being ſtraitned, they have not free Liberty to flow out, as in *Fig.* 1. But if we ſhould place this Ciſtern in the tops of the *Apennine* Mountains, probably the VVaters might riſe higher in them, when yet they do not riſe to the ſurface of the Ground. But I cannot certainly conjecture in what part, whether near the foot of the Mountain, or in their inner parts, this Ciſtern of VVaters is plac'd by the Divine Architect. I have

ſpar'd

ſpar'd no Labour nor Experiences to find out the Head of this Spring, and therefore I diligently viewed not only the Plain towards the Mountains, but the Mountains themſelves, and could find no Marks of it. I obſerv'd indeed ſome ſmall Lakes, but ſuch as dry up in the Summer, and ſo become Paſture for Cattel; of the number of which is the Lake *Paulinus*, 25 Miles diſtant from this. I thought beſt therefore to fetch the Original of theſe Waters from another ſource, *viz.* From ſome ſecret Ciſtern of water plac'd in the inner parts of the *Apennine* Mountains. And it is certain, that the inner parts of the Mountains are cavernous, and that there are in them Ciſterns of water, from whence Fountains and Rivers draw their Original. *Lucan* feign'd to himſelf a great Ciſtern of water in the heart of the *Apennine*, from which all the Rivers of *Italy* did flow, that run into both the Seas. I am willing to bring in here his Verſes, ſeeing to reaſon in ſo abſtruſe matters with the Philoſophers, or to conjecture with the Poets, is the ſame thing.

Fontibus hic vaſtis immenſos concipit amnes,
Fluminaque in gemini ſpargit divortia ponti.
In lævum cecidere latus veloxque Metaurus,
Cruſtuminumque rapax, & junctus Sapis Iſauro,
Quoque magis nullum tellus ſe ſolvit in amnem,
Eridanus fractas deducit in æquora ſilvas;
Dexteriora petens montis declivia Tybrim
Unda facit ——

Hence

Hence from vaſt Fountains do great
Rivers flow,
And into double Seas divorce do
ſlide
In ſeveral Channels, down on the
left ſide
Metaurus *ſwift and ſtrong* Cruſtumium *flow.*
Iſapis *join'd to* Iſaurus, Sonna *too,*
And Aufidus *the* Adriatick *beats;*
Eridanus, *than which no River gets*
More Ground,
Whole Foreſts rowls into the Sea
o'return'd.

But ſeeing 'tis known enough by what we have related in the Hiſtory of theſe Fountains, that this Spring is not ſo old as the world, ſeeing the laſt Plain in which the Auger was faſtned was formerly in the open Air, as the Trees in it make evident. If in the beginning of the World theſe Waters had flown as they do now, the force of the water would eaſily have thrown off that weight, as it happens ſometime when the boring is delay'd. Then one will ſay, When, and how had this admirable Source its Original? To this I may anſwer, That there are no Monuments of this; nor can it be abſolutely known when theſe waters began to flow; yet 'tis certain, that this Accumulation of the Ground hath not happen'd but after great Land-Floods; they leaving a great deal of Mud here; otherwiſe, as I was ſaying, the force of the water would have thrown off the weight. Therefore I am inclin'd to believe, that after the Plain was thus rais'd, ſome new ways were open'd by a great Earthquake, ſo that the waters might flow from the Ciſtern placed in the adjacent Mountains, which receives them by a continal evaporation from the Sea, and ſo might flow from that ſandy Ground, and ſo to have kept their Courſe for many Ages, before the wit of Man reach'd hither, and open'd the Veins of the Earth with the Augēr as with a Launce. And 'tis known by many Obſervations, that ſome Fountains die by Earthquakes, and ſome riſe; as *Ovid* ſays, *Lib.* 15. *Met.*

Hic fontes natura novos emiſit, & illic
Clauſit, & antiquis tam multa tremoribus orbis
Flumina proſiliunt, aut excæcata reſidunt.

In Engliſh thus:

Here Nature, in her Changes manifold,
Sends forth new Fountains, there ſhuts up the old;
Streams, with impetuous Earthquakes, heretofore
Have broken forth, and ſunk, or run no more

CHAP.

CHAP. VI.

The Progreſs and End of theſe Waters is enquired into, and a Reaſon is given of thoſe things which are obſerv'd in the digging of the Wells.

'TIS worth the Enquiry, What is the Progreſs of theſe our waters that flow under ground, and whether they go? But here I ſtick, and there is no place but for Conjecture. I have often enquir'd of the Undertakers, Whether they felt the Auger to be carried by Violence to any ſide; but I could underſtand nothing certain of them. But ſeeing the length of this Source is far greater than its breadth, I think it more agreeable to truth, that theſe waters flow from Eaſt to VVeſt, according to the lenghth of the *Æmilian* way, which Tract of Ground is ſix Mile long, and but four broad, as far as I have had occaſion to obſerve; but when it has paſs'd the way, we may judge that either 'tis ſunk into theſe *Wells* of the Earth, or by ſecret turnings and windings falls into the Sea, according to the Laws by which the water circulates in the Body of the Earth, which we read deſcribed by *Eccleſiaſtes* in theſe words; *All Rivers enter into the Sea, yet it does not overflow; the Rivers return to the place from whence they came, thither they return again.* And the Heathen Poets, as *Lucretius*, in theſe Verſes, *Lib.* 1.

Debet ut in mare de terris venit humor aquari
In terras itidem manare ex æquore ſalſo.

As Rivers run from Earth, and fill the Main,
So ſome through ſecret Pores return again.

But alſo is proved by the moſt grave and modern VVriters, with many Reaſons, as *Arias Montanus*, *Varenius*, *Voſſius*, *Becher*, and many others, whom the moſt famous *Lanzon*, Phyſician of *Ferrara*, cites in his Animadverſions, full of variety. It may be doubted, and that not without reaſon, whether the courſe of theſe waters muſt be for ever. And truly, ſeeing from the times of the *Roman* Commonwealth, even to this Age, there hath been ſo great an accumulation of the Earth, as well in the City as in the adjacent Lands, and in the Channels of Rivers, there is no place left of doubting, but the courſe of theſe Fountains will at length ceaſe, the Cauſes continuing the ſame, to wit, while the next Rivers take away with them the ſpoil of the Mountains, and therewith cover the Plains that lie under. Therefore, as theſe Fountains for a far better uſe did riſe many Feet above the Surface of the Earth, but now rarely reaches its Surface; ſo we muſt think, that the time will come in which theſe waters muſt ſtand in their VVells, having no deſcent by which to run down: And theſe Changes, which ſucceed in great length of time, and without a VVitneſs, if we conſider the preſent ſtate of things, hardly deſerve Credit; yet the thing it ſelf ſpeaks that they have truly happened, and will ſtill follow: But becauſe (to uſe *Ariſtotle*'s words) the things are done in great length of time in reſpect of our Life, they are hid from us, and the ruine of all Nations does happen before the change of theſe things,is told from the beginning to the end.

But this is the common Fate of Cities that are plac'd in the Plains, that after many Ages they are almoſt half buried; or, (as the *Egyptian* Prieſt in *Plato* ſays of the Cities of *Greece*) are carried by the force of the Rivers into the Sea; though on the other hand, Towns which are plac'd on the tops of the mountains, their Foundations being par'd, do tell the Injuries of Time: A ſure Proof, that there is nothing conſtant and firm in this world, but that we muſt look for the City that is on high, and is to continue for ever.

But why theſe Fountains, ſeeing they are ſuppoſed to take their Original from the Sea, have no ebbing or flowing, as ſome Fountains, of which Writers take notice; as is that which *Pliny* the

Younger mentions in the Land of *Comoy*, which ebbs and flows three times in a Day. I think this to happen, becauſe water is furniſht to theſe Fountains from the Sea, by the Aſcent of Vapors; which evaporation, though it be not always equal, becauſe of the ſubterraneous Fires ſometimes weaker, ſometimes ſtronger, yet 'tis enough if it be ſuch as is ſufficient to keep the Ciſtern full always to the ſame height, on which depends the Equality of Flux of theſe our Fountains for ſo many Ages, whatever come of the water that ſometimes overflows, and is diſperſed another way. But why ſome Fountains at certain times flow, and at other times ebb, many Cauſes are brought, of which (I mean thoſe which draw their Source from the Sea) the Cauſe is the ebbing and flowing of the Sea, by force of which it comes to paſs, that as the Sea ebbs and flows, theſe Fountains are ſometimes obſerved full, and ſometimes empty.

We ſaid, that in the Winter-time a great Heat was perceiv'd in theſe Fountains, and in the Summer-time a great Cold; as appears alſo by the Thermometer let down to ſeveral Depths, and the Table before marked ſhews: Which Obſervations ſeem not a little to favour the Defenders of an Antiperiſtaſis; and ſo much the rather, that theſe Obſervations were not made in a Mountanous, but in a Champion Countrey. For I do not think it ſafe to try it in Mines, and the Caverns of the Mountains, becauſe of the Metallick Exhalations, and divers Salts and kinds of Marcaſites, with which they are pregnant; for when ſuch Subſtances are ſprinkled with Water, they grow hot like Quick lime, and raiſe divers Exhalations, which the Mineral Waters do teſtifie that break out hot; to which you may add, there are many Store-houſes of Fire, which may not a little alter the ſubterraneous Region, which happens not in great Plains, as is the Countrey on this and the other ſide of the *Po.*

Indeed, the moſt Learn'd Mr. *Boyle* has gathered many things of the Temper of the Air under Ground; all which yet he ſays he had from ſuch as made Obſervations on many Mines; where he alſo relates, that in the ſame places, and at the ſame times of the Year, there is found a different temper of the ſubterraneous Regions, becauſe of the different Nature of Salts. And he ſays, That from ſome Mines are felt hot *Effluvia* in the Summer-time. And 'tis obſerved, that not only out of the Caverns of the Mountains, hot Exhalations breath in the Summer-time, but alſo frequently a moſt cold Air. In *Etruria*, near the Lake of the *Vulſinenſes*, near the Town *Martha*, is a little Cave at the foot of a moſt high Mountain, which is not above 6 or 8 Feet deep; but in the ſide of the Cave at a little Chink the Wind blows ſo cold, that it may be compar'd to the Coldneſs of the North Winds. The Fathers of the Order of the Mimims of *St. Francis de Paula*, who have a Church with a Monaſtery near it, uſe this Cave as a Vault for their Wine; and in the Summer-time draw their Wine from thence as cold, as if it had been in Snow; yea, if they keep their Summer Fruits there ſometime, they draw them out ſprinkled with a cold Dew, as I have obſerved, during my ſtay with them, in the Dog days.

But in the great Plains where all the Earth is ſolid, and does not keep ſo many kinds of Salts or Fires inclos'd, if we might go down deeper by digging, a greater Certitude might be had of this ſubterraneous Temperature. But in theſe VVells of ours I perceived this Reciprocation of Heat and Cold ſenſible enough, as often as I deſcended into them at different times; but that there might happen no Deception by the Senſes being prepoſſeſs'd with Heat or Cold, I obſerved it manifeſtly by a Thermometer exactly ſealed. But whatever is the nature of Cold or Heat, (for 'tis not proper in this place to enquire whether they are bare Qualities or Corpuſcles cauſing ſuch a Senſation in us.) *Antiperaſtis*, as I think, ought not to be baniſh'd out of the Schools; for it may be explained right enough both ways. Whether therefore, according to the Diverſity of Climates and Countreys, there be a different Temper of the Air under Ground; yet 'tis certain that the Thermometer being let down, does ſpeak with diſtinct Notes, that there is at leaſt in the firſt Region of the Earth, (whatever be of the deeper and Central parts of the Earth) this Reciprocation of Heat and Cold, according to the different Changes of the Year; and always in a quality oppoſite to that which the external Air, in which we live, hath: So that here may be uſed that Sentence of the Noble *Hippocrates*, *Lux orco tenebræ Jovi; Lux Jovi tenebræ orco.*

But before we come out of theſe VVells, it will be fit to give the Reaſons of ſome *Phænomena* that are obſerv'd in the digging of them. It was ſaid before, that there is a great Reſt in the Air in the VVinter-time, ſo that the Candles continue burning; there is no ſmoaky Exhalation, and they eaſily draw their Breath ; but in the Summer-time there is raiſed a thick Cloud, the Lights are put out, and the Diggers are almoſt kill'd. But from whence this ? VVhen rather in the Winter-time, becauſe of the Heat, more intenſe at that time, and equal to the Summers Heat, it might ſeem conſonant to Reaſon, that in a moiſt place a ſmoaky Exhalation ſhould be rais'd, which ſhould trouble the Air, and put out the Lights ; but in the Summer, by reaſon of the Cold which lodges in theſe VVells, not much unlike the Cold in the VVinter, it would ſeem reaſonable that the Air ſhould be more pure, nor ſo intangled with groſs Vapours, as to be unfit for Reſpiration ! VVhether 'tis that the Heat, which in the VVinter-time is in theſe *Wells* by reaſon of an Antiperiſtaſis, being greater, hath force to diſſipate theſe Vapors ;

but in the Summer-time, by reaſon of the Cold, they cannot be diſſolved! Or rather, that the Exhalations in the Winter, that are raiſed by the Heat in theſe VVells, are lighter than the external and thicker Air, and ſo do aſcend more eaſily, but in the Summer are heavier than the external Air; and therefore ſtagnating there, cauſe a difficulty of breathing, and put out the Lights when kindled. But here I cannot but wonder, why in the Mines, though of great depth, as are thoſe in *Hungary*, the Miners continue any time of the Year with their Candles lighted, and that in any ſeaſon; nor do they feel ſo great an Inconvenience in breathing: But in our Wells that are in the open Air, and communicate with the open Air, not by turnings, but in a ſtreight Line, the VVorkmen in the Summer-time are almoſt ſuffocated, and their Lights put out; ſo that in the

Dog-Days there is no hiring of them to work. Perhaps this falls out, becauſe the Mines in the Mountains and dry places have not ſo groſs an Air, but ſuch as is ſufficient for Reſpiration; but theſe being digg'd in a Champion Countrey, and moiſt Ground, ſend forth Streams more plentifully; ſo the Air being filled with them is unfit for Reſpiration. I deny not but in the Mines the Miners are ſometimes troubled with ſhortneſs of Breath, partly by reaſon of their own Breaths, and partly becauſe of the Metallick Exhalations; yea, are ſometimes killed; ſo that, to prevent the Danger of being ſtifled, they uſe Air-Pumps, for taking up the fowl Air, and letting in freſh; a Deſcription of which you may ſee in *Agricola.* Beſide; they dig a Pit ſome diſtance from the Mine, tending downwards, from which a

Lib. 7. *De re Metallica.*

Mine is extended to the place where the Diggers work, which ſerves for a Wind Pipe; and by bringing in freſh Air, and driving the old to the Mouth of the Pit, does much refreſh the VVorkmen, and frees them from the danger of being ſtifled; but that is only done in the deeper Mines, as *Agricola* and Mr. *Boyle* relate. The Lights therefore are put out in the Summer-time in theſe VVells, and the Diggers are ſeiz'd with a great Difficulty of breathing, becauſe the Air in it is fill'd with groſs Vapours; which thick and ponderous Vapors cannot aſcend in the hotter and lighter Air, but are to lodge there by reaſon of their weight. But the Vital Light requires of neceſſity a thinneſs, and empty ſpaces in the Air, in which it may lay down its Fulginous *Effluvia*, and needs freſh Air for its Food, otherwiſe it quickly dies.

It was obſerved before, in rehearſing the curious things that occur in the digging of theſe VVells, that there are three Beds of Clay two of 11 Foot, another below it of leſs thickneſs, with marſhy Beds between them of two Feet thick. I have often times ſtudied to find out the Generation of theſe Beds, examining with my ſelf how they are diſtinguiſh'd in this Order of time thro' the whole Tract. I know there have been amongſt our Countreymen ſome who think, that theſe Beds of Clay are the Product of the Univerſal Deluge. But this Author, whoſe Name I now paſs in ſilence, leſt I ſhould ſeem to contend with the Ghoſts, (for he died this year) tho' he was born in this Countrey, yet having liv'd always abroad, was ſurely never preſent at the digging of thoſe Wells, but hath had from others all that he ſays of them: For if he had ſeen the Structure of theſe Fountains, he would never have written, that the Clay in theſe VVells was 24 Feet deep, and the marſhy Ground as thick: For there are three Beds of Clay, two of 11 Foot apiece, and one leſs, with their Beds of marſhy Ground between of two Foot a-piece. Therefore this Conjecture for the Truth of the Univerſal Deluge, taken from the thickneſs of the Clay, is of no weight.

I am perſwaded therefore, that after the Univerſal Deluge, whoſe Veſtigies are perhaps deeper, theſe Beds of Clay were produc'd by three particular Floods, yet great and moſt ancient; ſo that from one Flood to another much time interceded, in which the ſtagnation of the Water, and the Ground putrifying together with the leaves and roots of Reeds, gave Original to theſe intermedial marſhy Beds.

I can eaſily believe, that this Bulk of Clay was made of the Earth drawn down from the Mountains, by the haſty Deſcent of the Waters into theſe Valleys; ſeeing for gathering of Clay for the Potters, 'tis uſual with us to convey the VVater into Pits made by art, out of the Rivers *Scultenna* and *Gabellus*, by which means the Water being exhaled by the Heat of the Summer, there ſettles much Clay in them, which the Potters afterwards uſe for making their Veſſels. And *Pliny* teſtifies, That the Potters Art excelled in this City of old, becauſe of the Excellency of the Clay, and its toughneſs, ſaying, *That* Modena *was famous in* Italy *for Potters Work*; *when at that time*, as he ſays, *Luxury had come to that height, that Potters Work coſt more than Porcelline.*

And we have reaſon to think, that this diverſity of Beds, which is ſeen in great Plains, has been made by ſeveral inundations and accumulations of the Ground: But from whence that diverſity of Beds comes, which is alſo found in the Mountains, is not ſo eaſie to determine. *Agricola* ſays, there were ſixteen Beds of different Colours in the Mines of the Mountain *Melibocbus*, and of different heights; but if one could dig deeper, doubtleſs a great many others would appear. If we would ſtick to the Opinion of our *Faloppius*, 'twill not be a hard matter to underſtand the Generation of theſe Beds, and their Diverſity in the Mountains; for he thinks, that the Mountains were made by a dry Exhalation ſhut up in the Bowels of the Earth, which he gathers from their Pyramidical Figure; yea, he thinks they are nouriſhed by ſuch an Exhalation, and grow by peacemeal; from whence it comes to paſs, that, as in Sublimation of Antimony, Flowers of different ſorts are gathered according to the diverſity of the Pots, ſo he thinks the ſame to happen in the Caverns of the Mountains, according to the different Generation of Metals and Foſſils. But when in the Creation, Mountains were built by the great Artificer, 'tis fit to own they were made in their whole Perfection (as being the firſt Former of all things) and with ſo many Beds for various uſes.

Bartholine, in the Diſcourſe before cited, ſhews ingeniouſly the uſe which theſe Beds give, eſpecially thoſe of Clay, for the generation of Fountains, whether they be made of Rains, as the temporary ones; or of Sea-water, as the perpetual or regular ones: For theſe Beds are of ſpecial uſe for the

Collection of Waters into one Receptacle, and likewiſe for their running a long way, otherwiſe they ſhould be loſt; neither would there be any Reaſon, why they ſhould break forth in one place more than another; which uſe, without doubt, theſe Beds of Clay perform in theſe Fountains; for while theſe Waters run through the ſandy Plain, 'tis reaſonable to think, that there is another Bed of Clay lying under; ſo that being ſhut up above and below, they follow their courſe as it were thro' a Pipe, except when they break out into the Air, a way being open'd to them by theſe Wells.

Therefore ſuppoſing the hidden Expanſion of theſe Waters over the Sandy and Gravelly Plain, 'tis no wonder if a Noiſe be perceiv'd in the bottom of theſe Wells, while the Water runs through the Gravel, (which Gravel 'tis more probable to be there made of the Sand, than to fall from the Mountains, (ſeeing a great part of it is ſo ſoft, that by the only rubbing of your Fingers it is broke) and if the Water be rais'd in all the Wells to the ſame height, ſeeing there is the ſame Cauſe which drives it on high, to wit, the preſſure of the Water deſcending from an higher place, and from the ſame Receptacle. And laſtly, If they be equally pure and wholſom, ſeeing they are of the ſame Diſpoſition. For the ſame Reaſon the ſame Waters are the more lively, the more is drawn from them, and their ſlowneſs is corrected when it happens; becauſe by the Sand thrown up, and ſinking to the bottom, the hole made with the Auger is ſometimes ſtopt; a ſure Proof that theſe VVaters run through a ſandy Plain, but not at all through an immenſe wide

Space; which may be further known by the depreſſion and failing of the Ground, that is obſerved ſometimes to happen when too much Water and Sand has run out.

CHAP.

CHAP. VII.

The Proportions inquir'd into, that the Elevation of Water in a ſtreight Pipe, inſerted into a Horizontal one, has to the height of its Ciſtern.

THE Nature of Fluid Bodies is ſo abſtruſe and intricate, that it could never be enough explained by the moſt ſolid Wits. Among the Ancients *Archimedes* has left us a few Theorems, but of great moment, in a Book which he has written, *De Inſidentibus Humido*, Of things that Float; which Book, that I may uſe *Tully*'s own words of *Crantor*'s Books, *Is not great, but golden.* Among the Moderns, the Honourable Mr. *Boyle*, *Galilæus*, *Sterinus*, *Borellus*; and laſtly, *D. Guilielminus*,

In Lucul.

minus, a Noble Mathematician of *Bononia*, have chiefly cultivated this moſt noble part of Philoſophy; who though they all, by many Obſervations and Hydroſtatical Experiments have dived far into the wonderful Properties of Fluids, yet have left room for a further Enquiry; For if in any caſe *Seneca*'s words are of value, 'tis in this the greateſt and moſt intricate of all, in which even when much is done, the Age following will find ſomething more to do.

Seeing then, according to our Hypotheſis, the Waters of this hidden Source are movable and running, and withal aſcend on high; becauſe, as was ſaid before, the Paſſage by which they go out, and fall into a Gulph, is ſtraitned; and ſeeing the Aſcent into theſe Wells is conſtant and perpetual, nor can be done without ſome proportion to the height of their Ciſtern; becauſe this Ciſtern is ſuppoſed by us to be in the Foot of the neareſt *Apennine* Mountains, and higher by far than the Elevation of theſe Waters from the bottom of the Wells to the top; therefore I thought it would not be unprofitable nor unpleaſant, if I endeavoured to ſhadow out, if not exactly to deſcribe, ſuch a Proportion. Suppoſe then there be a Veſſel *ABC* full of water, to which a Pipe *DE* is faſtned in a Horizontal Line, and whoſe Orifice is half ſhut, ſo that the water does not flow with a full Stream: Let there be likewiſe in the middle of the Pipe *DF* another glaſs Pipe *HI* inſerted perpendicularly; therefore granting a free Paſſage to the water, I ſay, that the water will be lifted in the middle Pipe *HI* to ſuch a height, that if the height of the water contain'd in the Veſſel be of eight parts, the elevation of the water in the ſtreight Pipe *H I* ſhall be of ſix parts; and ſuch a Proportion will anſwer to any Diviſion of the Mouth of the Pipe *D F.*

For if the Orifice of the Pipe *D F* be wholly ſhut, ſo that no water runs down, none is ignorant that the water in the Pipe *H I* of its own nature muſt place its ſelf in the ſame Horizontal Line with the water contain'd in the Veſſel, to which effect two things doubtleſs concur with equal force, to wit, the preſſure of the water contain'd in the Veſſel, and the reſiſtance of the Obſtacle that wholly obſtructs the Hole in the Pipe, which ſtop is eqvivalent to a Power preſſing with equal force againſt the water ſtagnating in the Veſſel; if then the elevation of the water in ſuch a caſe is a produce ariſing from two Cauſes equally working, to wit, the preſſure of the water, and the reſiſtance of the ſtop, it will follow, that when the Orifice of the ſame Pipe *D F* ſhall only be ſtopt in part, the aſcent of the water in the intermedial Pipe *H I*, whatever it be, will be a Product of the ſame Preſſure, as in the firſt Caſe, and the virtual Preſſure of the Stop, but working unequally; from hence it comes to paſs, that when the Preſſure of the ſuperincumbent water in the Veſſel that preſſes it to flow out, is in the ſame degree and energy as before; and on the other hand, the force of the Stop is removed, the water cannot be lifted up ſo high in the Pipe erected perpendicularly, as to reach the height of the water contain'd in the Veſſel, but muſt of neceſſity be under it; ſo that if the height of the water were in ſuppoſition eight Foot, and operated with ſuch a Preſſure as were equal to that height, but the

Stop ſhould not act but half, *i. e.* as four; theſe two working together, and making the aſcent of the water, there cannot but happen an Effect, which is between theſe two Agents, as 6 is between 8 and 4, *i. e.* in an Arithmetical Proportion; and therefore in the ſuppoſed Caſe the Water will be only raiſed in the ſtreight Pipe *H I* to 6 parts, which Elevation is half the Aggregate of the height of the water contain'd in the Veſſel, and the power of the Stop.

This was my Reaſoning before I try'd whether the thing agreed to it; which I did, by inſerting a wooden and ſquare Pipe into the ſide of the Veſſel, as in *Fig. 3.* and fitting a glaſs Pipe divided into 8 parts, and erected perpendicularly to the ſame Pipe; then putting a ſtop to the Pipe, which might only obſtruct the half of it, I let the water run out, and obſerved that the water did riſe in the glaſs Pipe in the ſame proportion, to wit, as 6 to 8: Yet I muſt confeſs, that the aſcent of the water did not ſo exactly anſwer to the greater or leſſer Obſtacles put to the hole of the Pipe, becauſe perhaps of the difficulty of fitting divers Doors to the Orifice, and becauſe of the Undulation of the water produc'd in the Glaſs Pipe from the *Impetus*, where 'tis obſerved to go out. Having therefore communicated theſe my Obſervations to the moſt famous *Bocchabadatus*, Mathematician to the Great Duke, and my intimate Friend from our Childhood, (for I always thought it the part of an ingenuous Man, that I may uſe *Pliny*'s words, to confeſs by whom I have profited) he prompted me with a Method by which I might obtain my Deſire. When therefore he thought that the diverſity of Stops might be ſupplied, if to the hole of the Pipe, from whence the water ſhould come out, another ſtreight Pipe of the ſame bigneſs were ſet, but with a proportion to the height of the Ciſtern. I made Trial, and the thing ſucceeded according to my deſire.

So in *Fig*. 4. ſuppoſing the Altitude of the Water in the Veſſel to be of 8 parts, and the Pipe *MN* to be only of 4 parts, by which means 'tis equivalent to an Obſtacle that takes up half the breadth of the Aperture, letting the water run out, and the Veſſel always remaining full, the water in the Pipe *HG* appear'd ſuſpended in *E*, to wit, in the height of 6 parts, which is half the Sum of 8 and 4, the height of the Water and the reſiſtence of the Obex. In like manner in *Fig*. 5. when the Pipe is of the height of 6 parts, the water in the Glaſs Pipe *EF* was ſeen to riſe to *S*, to wit, to 7 parts. The ſame was obſerved (as in *Fig.* 6.) when the Pipe *E H* pouring forth the water, was of 2 parts, *i. e.* equivalent to an Obſtacle ſtopping the fourth part of the Orifice; for in the Glaſs Pipe the water ſtood in *T*, *i. e.* in part 5. and that as exactly as Phyſical Experiments will admit, as every one may eaſily try. I do not doubt but the ſame will happen in any other caſe; therefore Reaſon and Experience do ſufficiently prove, that the Water is raiſed in a middle Arithmetical Proportion between the force of the Obſtacle, and the height of the water in the Ciſtern.

While on this occaſion I diverted my ſelf in making various Hydroſtatical Experiments in the Dog-days, I happened to make a very curious Obſervation, to wit, That though the height of the water be the ſame in the Veſſel, and the ſame Horizontal Pipe be inſerted into it; yet in the perpendicular Pipes, according to the difference of their Situation, there is a notable difference of the altitude of the water in one and the other, as in *Fig.* 7. Let the Veſſel *A B C D* be full of Water, the Pipe *D H* be inſerted into it, and ſhut in the Extremity, and let *F G H I* be the Glaſs Pipes erected perpendicularly, but *M* the Pipe pouring out water. Therefore in the Pipe *F G*, according to what was ſaid before, the water will riſe to O, *i. e.* to parts 5. for the height of the Pipe *M* pouring out the water is ſuppos'd 2. and the height of the water contain'd in the Veſſel is as 8. But if the Pipe *F G* be transferred to *H I* (the Orifice where it was faſtned being ſtopt) the water will be raiſed higher, *i. e.* to *N*, to almoſt 7 degrees; which would likewiſe happen, if at the ſame time two Glaſs Pipes *F G H I* ſtood upright, and the Pipe *M* ſhould pour out water, the Veſſel being always full; for this different height of waters is perceiv'd well enough in every caſe. One may try the ſame, not only when the Pipe that pour'd out the water is longer or ſhorter, but alſo when many Pipes of different lengths, and with proportion to the height of the water contain'd in the Veſſel, ſend forth water at the ſame time, and many Glaſs Pipes are interjected, ſeeing many caſes may be fain'd according to every ones Fancy. But ſeeing there is no ſmall Undulation in the Glaſs Pipes, becauſe the water running out at *M*, falls back upon its ſelf; this Inconveniency will in ſome meaſure be ſhunned, if the Pipe *F H* be ſomething bended, that ſo both the Glaſs Pipes, and the Pipes ſending forth the water be inclin'd to one ſide; for in this caſe there will happen leſs Undulation, and the different heights of the water may be more eaſily viewed.

The Reaſon of this Phænomenon I judge to be, that the Impetus *of the Water running from the Ciſtern out at* M, *withdraws ſome of the water from the Pipe* FG, *ſo that it cannot riſe ſo high; and the ſame* Impetus *coming to* HI, *finding now no Vent, makes it riſe higher, even to* N.

This new Obſervation I communicated to the ſame *Boccabadatas*, who, as he did not a little wonder at the novelty of the thing, ſo being a moſt ingenious and exact Searcher into natural things, he did not ceaſe to enquire into the Cauſe of it; yea, afterwards he told me he had the Demonſtration of it, which he ſaid he would inſert into his Work which he is to publiſh, about Mechanick Force. I thought fit to propoſe this *Phænomenon* to the Lovers of Hydroſtaticks, thinking it worthy of the conſideration of the more acute VVits, to the end it may be diſcovered from whence this Diverſity of Preſſures proceeds.

CHAP. VIII.

About the Goodneſs and Excellency of the Wells of Modena.

THerefore having ſail'd over theſe Subterraneous Waters, according to the beſt of my Underſtanding, as far as I could in a dark Navigation, in which neither the Stars nor the Needle did guide me, it remains that

I furl my Sails, and haſten to the
Land. Georg. 4.

But that I may not paſs over with a dry Foot the nature of theſe Fountains, ſo far as they are uſeful to Men; and leſt, as the Cuſtom is of thoſe that are thirſty, I drink quietly. I ſhall touch only at ſome things relating to this Subject,

ject, though it ſeem to be beyond my purpoſe. 'Tis an old Diſpute, what in the Claſs of ſimple Waters is moſt wholſom? ſeeing ſome prefer Rain-waters, others prefer Fountain-waters; in ſome places River-waters are moſt preferred, in others Well-waters. *Hippocrates* ſeem'd to prefer Rain-waters to all others; for theſe he called the ſweeteſt, the thinneſt, and the cleareſt of all; ſeeing what is thinneſt and lighteſt of the water is exalted and drawn up by the Sun: Yet 'tis certain *Hippocrates* ſpoke of Rain-waters in the Summer-time, which they call *Horaiæ*, *i.e.* Early, ſeeing among waters that want Art, he commends theſe, which in the Summer-time fall down from the Sky when it thunders; but theſe that fall in Storms he pronounces bad. *Celſus*, *Galen*, *Avicenna*, *Paulus*, and others, following *Hippocrates*, judge the ſame.

On the other hand, *Pliny* does greatly diſcommend Rain-waters; yea, he is ſo angry, that he thinks the Opinion which commends them, to endanger Men's Lives; neither does he think it an Argument of Levity that they have been raiſed to Heaven, ſeeing Stones alſo have been rais'd to Heaven; and further, VVaters, when they fall from the Clouds, may be infected by the Exhalations of the Earth, ſo that Fountain-water to him ſeems preferable to them, when Plenty of them may be had.

But if the thing be duly conſidered, there will be no place left to diſpute; for all Rain-waters, as alſo Fountain-waters being not of the ſame Goodneſs, ſeeing every Countrey has not the ſame Atmoſphere, nor the ſame Ground thro' which the water paſſes, ſeeing alſo, according to *Theophraſtus*, ſuch as the Earth is, ſuch is the Water) it often happens, as *Coſtæus* adverts, that in ſome places for the Purity of the Air, the Rain-waters are better, but in other places the Fountain or River-waters are the beſt; as the water of the River *Nile*, whoſe much wiſh'd-for Inundation keeps all *Egypt* every Year ſolicitous. But 'tis no wonder that the water of the *Nile* excels in Goodneſs all others, ſeeing running a long way over a Countrey burnt with the heat of the Sun, 'tis concocted, and is toſſed by ſudden Falls from the higheſt Mountains, and attenuated. Hence *Athenæus* teſtifies, That when *Philadelphus* King of *Egypt* betroth'd his Daughter *Berenice* to *Antiochus* King of *Aſſyria*, he willed her to take with her the Water of the *Nile*.

Yet when other things do not agree, it ſeems the Fountain-waters ought to be preferred to Rain-waters, and all others; for Rain-waters are drawn from all ſorts of Filth, Dung and Dead Bodies themſelves; and though *Hippocrates* judged them beſt, yet he adds, That they have need of being boil'd and ſtrain'd. Wherefore 'tis not without Reaſon, that ſome do diſprove making of Syrup of Poppeys with Rain-water; and they think that *Hippocrates* ſpoke according to Reaſon, and not Experience. So among the Moderns, the moſt experienc'd *Etmuller* ſays, *That Rain-water kept always ſomething Earthy behind it, though diſtilled a hundred times.*

But ſo will any Water do as well as Rain water.

But Well-waters, ſeeing they have no Motion but when they are ſtirred, and in the bottom have much Slime, and Rain-waters being gathered of Snow and Rains, and running over divers kinds of Earths, and are therefore by *Hippocrates* call'd *diſagreeing*, cannot have that Purity and Simplicity which the Fountain-waters have, which are concocted by the Heat pent up in the Bowels of the Earth, and are ſtrain'd through the ſame Earth.

Therefore our moſt pure Fountain-waters, as they have the firſt place in the Rank of plain waters, ſo they yield to none of the moſt famous Fountains of our Times; for as much as the Marks, by which the moſt ſincere Waters, and fitteſt for Humane Uſe, are commended, do appear in theſe in a moſt eminent manner. The chief Quality that is wanted in water, and which contains the reſt, by way of Excellency, is, *that it partake moſt of the nature of the Air.* So *Pliny* hath written, That wholſom water ought to be moſt like to the

Air. On which Account *Caſſiodorus* commended the Virgin Water, ſo famous then at *Rome, that running moſt purely it reſembled the Air.* For water ought to be pure, like the Air, light and clear, free of ſmell and taſte, thin, and ſuſceptible of Heat and Cold. But the waters of theſe Fountains are ſuch; for they are cleer like the Air, free of ſmell and taſte, do moſt quickly receive any other quality, and being weigh'd are lighter than any others.

Though Phyſicians do not ſeem to value much the Argument taken from the Lightneſs; and the Divine Maſter calls theſe light, *which are* 5 *Aph.* 26. *ſoon hot and ſoon cold.* And *Pliny* writes, *That* *Lib.* 31. *N. H. c.* 3. *'tis in vain to examine by the Balance the goodneſs of the Waters*; ſeeing it ſeldom happens that one is lighter than the other;

which *Braſavolus* try'd in ſeveral kinds of Waters, before *Hercules* the Second Duke of *Ferrara*; Yet ſeeing there are not wanting more ſubtile ways of knowing even the leaſt difference of weight in waters, according to the Doctrine of *Archimedes*, Levity is not altogether to be neglected; for Levity ſignifies the abſence of the Terreſtrial parts, and is a ſure Proof of greater ſimplicity. Truly 'tis without doubt, that if there were two Veſſels of the ſame capacity, and full of the ſame water, and in one of theſe, divers kinds of Salts were diſſolved in a certain quantity; though the water did not grow in bulk, yet the one will be of greater weight than the other, and will be filled with ſtrange qualities; wherefore Gravity and Levity are not to be ſlighted. I will not deny, that ſome waters naturally light

One may rather ſay Saline.

light, are worſe than others that are heavier, becauſe of the evil qualities of the Soil through which they paſs. *Athenæus* ſays, That the waters of *Amphiaraus* and *Etreria* being compar'd together, do not differ in weight, yet the one is wholſom and the other not. So *Titareſius*, a River of which *Homer* ſpeaks, running into *Penæus*, is not mixt with it, but ſwims over it like Oil: Yet *Pliny* ſays, his waters are deadly. And he ſays, That *Penæus* refuſes to ſuffer his ſilver-colour'd waters to be mix'd with the others deadly waters. If we infuſe a whole Glaſs of Antimony in water, otherwiſe light, no weight will be added to it to judge of; but none is ignorant what Diſorders it raiſes in the Body.

And it is neceſſary to confeſs theſe things to be true of the lightneſs of the water conſidered alone, but if with other marks of goodneſs there be lightneſs join'd, it will be no ſmall acceſſion to its goodneſs. *Herodotus* deſcribes a Fountain of *Æthiopia*, the water of which he ſays was of ſuch lightneſs, that nothing could ſwim in it; no, not a Stick, nor what was lighter than a Stick; and ſuch as uſed thoſe waters were called *Macrobii*, *i. e.* Long-liv'd. *Galen* himſelf commends the lightneſs of the water for a probable conjecture of its goodneſs. But if the lightneſs be alone, ſays he, 'twill not be a ſufficient mark of good water: which one may alſo ſay of all the other Signs, ſeeing none of it ſelf, and ſeparately is a ſufficient Mark of its goodneſs.

In Thal.

De Bonit. aq. c. 1.

But a ſurer Mark of the goodneſs of water is, if it be not heavy in the Bowels; for this is truly the lighteſt, and this kind of lightneſs is more to be eſteemed than that which may be try'd with the Scale. For we muſt not preſently, becauſe 'tis Ἄρεως, *i. e.* Deprived of all quality, ſo as to be pure, clear, void of ſmell and taſte, give Sentence, and pronounce it innocent; but we muſt bring another Proof, *viz.* How they affect the Bowels; for it may be that it has all external Marks of Goodneſs, yet has a more ſecret Noxiouſneſs, which cannot be found out by the external Senſe. This therefore will be the true and ſafer Judgment of waters, which is brought from Experience it ſelf: And truly that water is to be thought light by the Effect, which makes not the Bowels feel any weight in paſſing; for which kind of lightneſs the waters of *Modena* are very commendable, as not weighting the Stomach when one drinks a full Draught of them, but eaſily paſs through the whole Body, and are voided by Sweat and Urine.

But above all theſe, *Hippocrates* chiefly commends theſe Fountains, whoſe waters come forth of deep Springs, which are cold in Summer, and warm in Winter; but all theſe things are obſerved in theſe Fountains, ſeeing they riſe 68 Foot high; and in Summer are very cold, but in Winter are warm, yea, exhale ſome ſmall Vapors. Neither muſt we refer the Heat which is found in theſe waters in the Winter-time to metallick Exhalations, or a mixture of Salts with an acid Mineral, ſeeing that is perceiv'd only in the Winter-time by an Antiperiſtaſis.

All know that there are as many differences of Waters as of Places; for Fountain and Well-waters do eaſily drink up the difererent ferent qualities of the Ground, through which they paſs, which are innumerable; yet thoſe waters are thought more wholſom, that run through thick Sand and Gravel, becauſe they carry nothing from ſuch a matter upward, which cannot be ſaid of that which runs through Clay and ſoft Sand. But the waters of theſe Fountains flow a long way through Sand, which is called *Male*, a Proof of which is a great abundance of Droſs, Sand, and Gravel, which theſe Fountains uſe to throw up at their firſt coming forth.

Moreover, theſe waters, according to my Obſervation, and of many others, continue without Corruption for a long time. For it is found by Experiment in long Navigations, that the water of *Neuceria* did ſtink, but ours continued pure. I am not ignorant, 'tis a Queſtion among Phyſicians no leſs curious than worthy to be known, Whether the ſudden Corruption of the water be a mark of its Goodneſs or Badneſs? Perhaps *Hippocrates* himſelf gave cauſe of doubting, who, after he had commended Rain water, ſays, *They ſoon putrifie, except they be boil'd and ſtrained again.* *Galen*, *Paulus*, *Avicenna*, and ſome of the Ancients; amongſt the Moderns, *Joubertus*, *Salius*, *Augenius*, *Bruvierinus*, and many others, take the waters readineſs to putrifie for a ſign of goodneſs, providing other Notes agree. For the chief Property of water is, ſay they, that they be quickly altered by any external Cauſe; and from thence they think its inclinableneſs to Putrefaction to ariſe: But theſe which continue long free of Corruption, ſay they, partake of an aluminous nature: Such are the waters of *Tyber*, which are kept in

Earthen Veſſels for Months and Years, under Ground, without Corruption. On the other hand, there are ſome who think an inclinableneſs to Putrefaction among the faults of water; among whom is *Coſtæus*, who ſays, *That it is a mark of the beſt water; that they do not ſo eaſily corrupt*: And is deſervedly oppos'd to *Avicenna*, who thought that Rain-waters were ſoon corrupted, becauſe they were thinner: For rather from thinneſs of the Subſtance one might argue, that their Subſtances are leſs ſubject to Corruption, as is known of diſtilled waters, and Spirits of VVine, which truly is thinner than VVine, and not only does not putrifie it ſelf, but alſo preſerves other Bodies free from Corruption.

Seeing then Experience it ſelf makes it plain, that thoſe which are moſt ſimple do leſs putrifie;

but thoſe which have a greater Heterogenity, becauſe of the Diſagreement of the Internal Parts, and a continual Fermentation, are more eaſily corrupted. Therefore I am eaſily induc'd to believe, that the Corruption of the water is rather to be attributed to its Pravity, than Goodneſs. But the Reaſon why the Rain waters ſooner putrifie, may be this, that when by the Heat of the Sun the water is rais'd from the Earth, all ſorts of Filth are raiſed with it, and a great quantity of Volatile Salts is mixed with it: which made *Becher* ſay, *That all Rain-waters being putrified and diſtilled, did give an ardent Spirit.*

But if promptitude to Putrefaction were a Sign of Goodneſs, why may we not ſay the ſame of Eatables, which naturally do ſoon putrifie; ſuch as are Fleſhes, Fiſhes, VVorts, early Ripe Fruits, and the like, *viz.* That theſe Aliments are better than thoſe which do not ſo ſoon putrifie, ſeeing they are ſooner alter'd by the concocting Faculty. Weaker Foods have a ſhorter Life. *Hippocrates*, as *Valeſius* interprets, ſays, they make Men's Lives ſhorter; and ſuch as eat theſe Meats are infirm and weak, and cannot live ſo long. So Bread of Wheat well fermented, and well bak'd, gives a moſt excellent Nouriſhment, and long Life, to ſound Bodies; and Bread of all Food does leaſt putrefie. Upon which account 'tis, that *Levinus Lemnius* commendeth it. *For* (ſays he) *Bread long kept does indeed grow mouldy, and grows dry, but does not putrefie.* Therefore 'tis not a little to the Praiſe of our Fountains, that they do not corrupt; ſo that having other Marks of Goodneſs, they are to be reckon'd the beſt of Waters.

'Tis an old Commendation of Waters, if Pulſe be quickly boil'd in them, as *Pliny*, *Athenæus*, *Vitruvius*, *Galeus*, *Paulus*; and among the Modern Phyſicians, *Langius*, *Coſtæus*, *Bruvierinus*, and others, do teſtifie. But 'tis known, that this alſo is common to unwholſom Waters; for the difficulty of boiling ſome Pulſe is not always by the Fault of the Waters, but very often of the Grains themſelves, as they have grown in this or the other Ground, as *Theophraſtus* teſtifies, when he ſaid, *That there are many places which always bring forth Pulſe that are eaſily boil'd, others there are which bring forth Grains hard to be boil'd.* Yea, *Plutarch* ſays, *That of two Furrows join'd together, one brings forth a hard Crop, the other not.* The Women themſelves know that well enough, who if they have Pulſe that are not eaſily boil'd, uſe to macerate them a Night in water with a Sack full of Aſhes, by which means the cloſe Texture of the Grain is open'd by the force of the Salt in the Aſhes. And I think none will look upon the water, ſo made lixivial, as ſimple; or will commend it for daily drinking in whole Bodies. Yet I cannot deny, that ſalt and crude waters, very far diſtant from the beſt, may be for ſome ſickly Natures; or in a neutral ſtate of Health, inſtead of Medicine, which *Hippocrates* hath taught expreſly in theſe words: *But whatever are ſalt and crude, are not fit for all to drink of; yet there are ſome Natures to whom ſuch Waters are convenient to be drunk.*

Whatever were hard to be boiled, the *Greek* call'd *Aterammia*, transferring likewiſe the ſame word to a ſtubborn and inflexible Mind. So Grains hard to be boil'd were call'd Ατεράμνια Ὄσπρεια; ſuch as are thoſe which *Theophraſtus* ſays, grow in a thick tough Earth, and as it were clayie; as at *Philippi*, when the Pulſe which *Egypt* bears, both by reaſon of the nitrous Soil, and the Heat, are eaſily boil'd. Likewiſe water, in which Grains were hardly boil'd, was called Ἄτεραμνος, which word *Hippocrates* us'd to ſignifie the water in many occaſions, of which *Erotianus* hath in his *Onomaſticon* made a Collection. Therefore, as the Difficulty of the Pulſes being boil'd is not always the Fault of the waters, ſo their being eaſily boil'd is not a Mark of their Goodneſs; which ſometimes is proper to the Seeds, ſometimes to the VVaters; yea, more effectual in ſome waters that are not of the beſt; ſeeing in nitrous and lixivious water Pulſe, Roots, and Worts are ſooner boil'd. Upon this account in

Rain-waters, as being full of Saline Particles, all kind of Grains are ſooner boil'd than in Fountain-water, which is more pure and defecated. Upon this account *Horatius Augenius*, preferring Rain-water to others for making of Ptiſan, when he had taken notice that Barley did ſooner boil in this, than in Spring-water, of his own accord confeſſes, That the Rain-VVaters are not ſincere; which made him go into this Opinion as a Paradox, That the purer the water is, and leſs mixt, the leſs 'tis fit for the uſe of Life. But in our Fountain-waters, Pulſe of all ſorts is eaſily enough boil'd, and any other kind of Aliments, which, as I dare not diſcommend in them, ſo I think is no way to be taken for a Mark of the beſt.

But certainly that is a greater *Criterion* for judging of the Goodneſs of plain VVaters, which, as

Vitruvius ſays, is taken from the Habit of Men's Bodies that live about thoſe waters; to wit, if they be robuſt, clear Complexions, ſound, and not blear-ey'd. Now 'tis known enough, that both Citizens, and ſuch as live in the Suburbs here, are of a good Habit of Body, and ſubject to none of theſe Diſtempers; and the good Health which thoſe of *Modena* enjoy beyond other Towns on this ſide the *Po*, is not ſo much to be aſcribed to the wholſomneſs of the Air, as to the goodneſs of the Waters; as in *Egypt*, where their long Life, according to *Alpinus*, is attributed to the water of the *Nile*. Seeing therefore in the moſt ſtrict Cenſure, the waters of theſe Fountains are not only innocent, but wholſom, truly this City has nothing in which it may envy any other as to this point; yea, ſeeing its waters are carried to the neighbouring places in the Summer-time, the *Nucerian* water is now out of uſe, to the great benefit of the ſick. So in the Summer time they run to theſe Fountains in all kinds of Fevers, (for the uſe of water, that I may not ſay the abuſe, is grown ſo frequent, that it ſeems the only Febrifuge) and chiefly to the Fountain which is called *Abyſſus*, as to the VVell of *Eſculapius*, of which we ſpoke before. VVherefore I need not fear to make uſe of what *Claudian* ſays of *Aponus*, That they are at leaſt amongſt our Countrey-folks.

—— Commune Medentum
Auxilium, præſens numen inempta ſalus.

Phyſicians common Aid, a preſent Help,
A Powerful Deity, and an unpurchas'd Health.

And ſo much may ſuffice concerning the Nature and Properties of the VVells of *Modena*; and if I have ſaid ſomething like probable, 'tis well; but if not, then both for the Dignity and the Difficulty of the matter, *Volutatum eſt dolium in Cranio.*

FINIS.